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Vocational Guidance: A Review and Program

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FOR the past decade we have been hearing and reading a great deal about that somewhat loosely defined movement called vocational guidance. A meager handful of enthusiasts, among whom may be included the writer, have spent much time teaching, talking, and propounding vocational guidance. In one prominent and oft-mentioned university, it was, and is still, deemed of sufficient importance to have a course covering one entire school year to which only candidates for the master's degree or the doctor's degree are admitted.

The movement has even attained to the dignity of having formed a vocational organization, the "National Vocational Guidance Association", to advance its interests. But much to our sorrow, even this is at present in a state of seeming inoccuous desuetude. Even the prophets and apostles of the movement have either passed on to fields offering opportunities for greater service or greater remuneration, or else have settled down and adopted the *"laissez faire"* attitude of mind and action concerning the entire movement. It is reported unofficially that approximately five hundred schools in the United States have socalled systems of vocational guidance. But we have been able to discover only a single town, Cincinnati, that can reasonably claim to have anything approaching real vocational guidance in its fullest sense, within its public school system. Most of the vocational guidance work emphasizes vocational placement, the socalled vocational guidance counsellors being really "job finders".

At the present time, the whole movement of vocational guidance seems to be resting just between the ebb and the flow of the tide of enthusiasm and propaganda. The time has come to seriously consider the movement, its values, methods, and organization, to discover whether or not it has within it anything really worth while in its philosophy or organization (at the present time, it is lacking almost entirely in content and subject matter), and to see wherein and wherefor it has failed to attain to the position of importance or to the measure of appreciation that its advocates claimed and hoped for it.

Educators must learn to take stock of themselves. If education is ever to become a science, educators must develop the scientific attitude of mind and approach the problems of education calmly, logically, and without prejudice or personal partisanship. The time has come to adopt this attitude in regard to the entire question of vocational guidance.

It must be admitted that up to the present time vocational guidance has been quite largely a "me too" proposition, tagging on to better organized movements somewhat like a small boy, full of faith, hope and potentialities, catching a free ride. To carry the analogy to the extreme, some times the whip has been applied to discourage the earnest attempts to climb aboard for a free ride. Vocational education was one of the first movements that vocational guidance endeavored to link up with, and even today some enthusiasts claim the whole field of vocational education as the exclusive property of vocational guidance. There is some very slight reason in this claim as will develop later. Next, vocational guidance tagged on to prevocational education, with its differentiated courses in the junior high school and the supposed freedom of choice in its "try-out" and "self-discovery" courses. Then, we talked a great deal about vocational information to be given usually in the English classes by charming young ladies who for the very good reason that they had had no vocational experience, had little vocational information to give, and that which they attempted to give consisted largely of misinterpreted mis-information, obtained from books. Later came the flurry of the "United States Boys' Working Reserve", with its voluminous propaganda and extensive publicity. This organization has only recently departed from our midst. More recently attempts have been made to tie up with the Junior Employment Service of the United States Department of Labor,—a very good scheme in many respects, but one, unfortunately, without the necessary finances. This plan makes no claim for real guidance, but is essentially a job-getting proposition as its name indicates.

More fundamental than all these past attempts to find a niche for itself is the fact that the advocates of vocational guidance as a whole have not as yet reached any agreement concerning the serious question of whether or not vocational guidance is to act as a vehicle for the pseudo-scientific character analysis phrenologists and physiognomists, quite often termed "bump-feelers

and readers". Among certain groups of well-meaning but gullible people, the plausible demonstrations of these so-called character analysts pass for scientific fact, and unfortunately, in some parts of the country, vocational guidance counselors have been taken in by the promise of the acquirement of omnipotence and infallibility in a few easy lessons for a fat fee paid to these "professors" of character analysis.

At the present time vocational guidance is not taken seriously by the public, by school administrators or teachers generally. There probably is not a single public school system in the entire country where a well-organized system of real, effective, scientific vocational guidance is in operation. The writer believes that there is at the present time a greater need for and greater possibilities in real vocational guidance than at any time since the inception of the movement in this country. The reason for its present condition and lack of progress is because its advocates have been doing very little real research work and have developed no really scientific methods nor systems of vocational guidance that fit the needs of the public school systems or satisfy the insistent demands of society or of the present industrial civilization.

There are certain fundamental propositions that must be developed and agreed to before vocational guidance can come into the eminent place in our school systems and in society to which its sound general principles give it an unqualified right. The following propositions are proposed as a basis for discussion and eventually formulation into a working program.

(1) That the term "vocational guidance" be discontinued and "vocational and educational guidance" be adopted. One of the functions of a counsellor is to guide the pupil in the direction which will result in the greatest good to the individual and to society. The counsellor, when guiding the pupil, has the following paths open before him: (a) The pupil may be advised to continue his present work in school. (b) The pupil may be guided into a different course, either vocational or academic, within the school. (c) The pupil may be guided into a different school within or without the school system. (d) The pupil may be guided into a vocational education course within or without the school system. (e) The pupil may be guided into some specified and suitable occupation and a job found for him. It will be admitted that a large share of this guidance is educational as well as vocational. Therefore, the suggested term "vocational and educational guidance."

(2) That a definite and decided stand shall be taken and maintained, against the use in vocational and educational guidance of the socalled character analysis of the phrenological and phsysiognomical type for the following reasons: (a) Altho cerebral localization for certain sensory and motor centers has been scientifically demonstrated, it has also been scientifically demonstrated that there is no similar cerebral localization for such general traits of character as self-esteem, acquisitiveness, secretiveness, constructiveness, combativeness, calculation, language, firmness, spirituality, number, time, tune, weight, color, etc. (b) No scientific data has been presented to prove that there is any correspondence between size and functional capacity of any portion of the brain. No scientist has as yet established any correlation between definite areas of the brain and specific mental, moral, or emotional characteristics, but it is a scientifically established fact that there is no correlation between the volume, shape or weight of the brain and the general traits of character emphasized by the analysts. The evidence presented leads us to believe that functional capacity depends on the complexity and type of structure, of chemical and molecular action on the convolutions, and the quality of the brain structure rather than on mere mass, weight, or shape. (c) The shape and varying thickness of the bones of the head are no indication as to whether tissues of any kind or cerebro-spinal fluid will be found underneath. In other words, it is a scientifically established fact that the conformation of the brain does not necessarily follow the conformation of the outside of the skull. (d) The entire body of claims made by the character analysts is based upon limited and very casual observation of exceptional cases, the observational method being used almost entirely thruout. (e) Most claims are not based on objective evidence that can be scientifically measured and tested. (f) On the basis of physical stigmata alone we are unable to decide the presence or absence of specific traits or abilities, nor are we able to decide whether the individual is a desperate or a degenerate criminal, a pervert, a mediocre person or a genius, an idiot, an imbecile, a madman or a fool. Fine hair or delicate skin does not necessarily indicate delicacy of perception, judgment or sensitiveness. A "convex, concave, or plane" face is no criterion of the quality of brain or of its functioning. (g) Up to the present time no character analyst has presented any scientific data as proof for the wide-sweeping claims and assertions made by them. Finally, the claims of the so-called observational science of character analysis rest on assumptions entirely unwarranted by the facts.

(3) That vocational and educational counsel shall be given only after a scientific determination of the major characteristics and vocational aptitudes of the individual along with a study of such parts of his or her economic and sociological environment as would have weight and value in determining a possible course of procedure.

(4) That this scientific determination of major characteristics and vocational aptitudes shall be based on the proven tests and methods of the science of psychology, the methods to be used being those of psychological research.

(5) That vocational placement shall be effected

only after scientific determination of vocational aptitudes of the individual and an accurate analysis of the job in terms of necessary vocational aptitudes and of the physical, educational, and general intelligence qualifications necessary for success on the particular job. With this analysis there should be a study and definite statement of the lines of promotion leading upward from the job. Accompanying this should be a statement of the educational requirements necessary before one can follow this indicated line of promotion.

The larger part of the socalled vocational guidance in this country at the present time is mere job-getting—the one notable exception being Cincinnati—the major part of all the work being without any attempt at real analysis of the limitations, requirements, and opportunities involved in the job, or the suitability of a particular individual for that particular job.

(6) That vocational placement involves vocational supervision on the job. At the present time there is very little vocational supervision except a pseudo type, in those states where that kind of employment certificate system is in force, that requires the individual to obtain a new certificate with each new job. In the vast majority of cases, the issuing of this new certificate is a mere matter of routine, attended to by a clerk. Vocational supervision is necessary to check up on the vocational counsel given and to discover whether the educational work of the schools, vocational and academic, is really functioning in its attempt to fit the individual to enter upon his or her economic and social life effectively and efficiently.

(7) That vocational supervision has a decided part to play in the upgrading of individuals on the job by advocating promotion or transfer and by advising further education to prepare for such promotion and transfer.

(8) That entrance upon vocational education courses shall presume vocational guidance based upon a scientific determination of the vocational aptitudes of the individual and an accurate analysis of the essential qualifications necessary for success in that vocation.

(9) That we advocate a continuous inventory of all school pupils who have reached the age of one year before the end of the compulsory attendance period, the purpose of this inventory being to discover those pupils who will in all reasonable certainty leave school on reaching the age at which school attendance is no longer compulsory. That for this group of pupils a variety of prevocational or vocational courses shall be offered during this, their last year. That thruout this year, vocational and educational guidance shall have an important part: first, in making a complete analysis of the individual; secondly, a complete analysis of the job; thirdly, the fitting of the two together, thus resulting in a decided benefit to the individual and to society, thru the individual's entering upon economic life in an effective and efficient manner.

The carrying out of such a program as suggested is simply a practical and effective method of bringing down to earth our often-quoted, big-sounding educational slogans, "Education for Citizenship" and "Education for Democracy." It will mean another step in the reconstruction of our educational systems into a more truly democratic system than we have at the present time, a system in which the children of poor parents will have an opportunity for a fitting, effective, and efficient education such as is now offered to the children of rich parents.

GRAPHIC AIDS IN ANALYSIS

Clyde A. Bowman, Stout Institute, Menomonie, Wis.

(Conclusion)

The Metal Working chart is a classification based on materials used, of a group of related trades to indicate the trend in the specialization in learning opportunities. Beginning at the right are suggestive divisions of the work in the various kinds of metal work, showing general subdivisions as now trending. These sub-divisions are suggestive of the extent to which workers are able to learn their jobs. At the left of the chart is graphic recognition of the fact that in typical metal product manufacture some or all of the metal trades are involved.

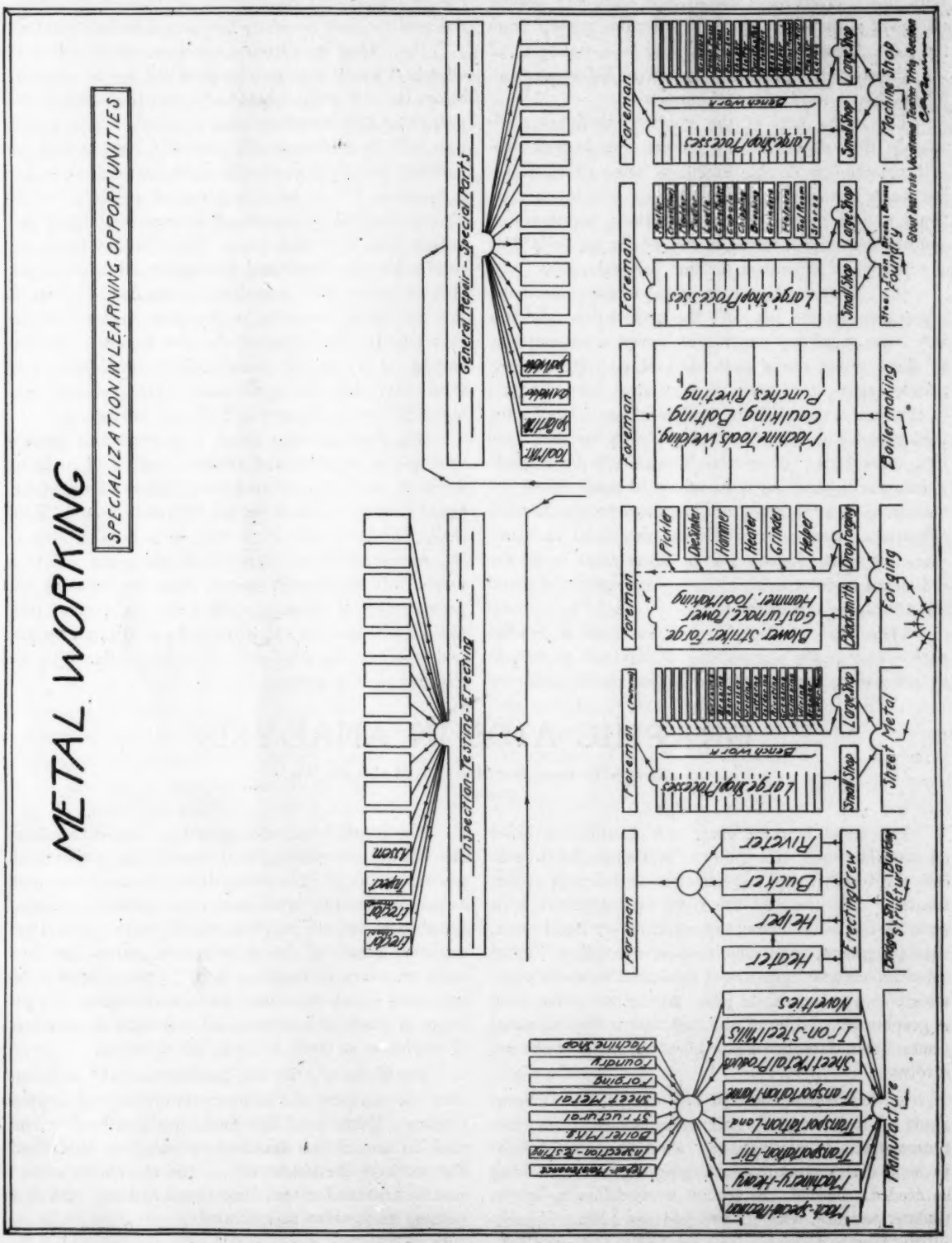
In detailing a chart of any one of the different kinds of metalwork, forging, machine shop, etc., two general methods may be used. First, the general occupational divisions as in the forging detailed chart may be needed. Second, the general work, following initial trade experience, with its two-fold specialization possibilities may be necessary for local studies of large plants.

The sample chart of forging is a suggestive assignment chart for working out courses for students in teacher training. The occupational divisions are used as aids in directing trade analysis in indicating content for shop experience and for related study. Initial assignment charts of the same general nature are used when necessary in machine shop, foundry, boiler making, sheet metal, structural, and manufacture. No attempt is made to relate size of rectangles to numbers of employees as chart is for initial direction.

The division is first on manufacture and maintenance. In manufacture a large part of the work is drop forging. Entry into this field usually means special work in one of the divisions indicated on the chart. The work of the blacksmith in the manufacture is of general interlocking trade experience and may lead to a position as foreman as indicated.

In maintenance the worker may go into rural black-

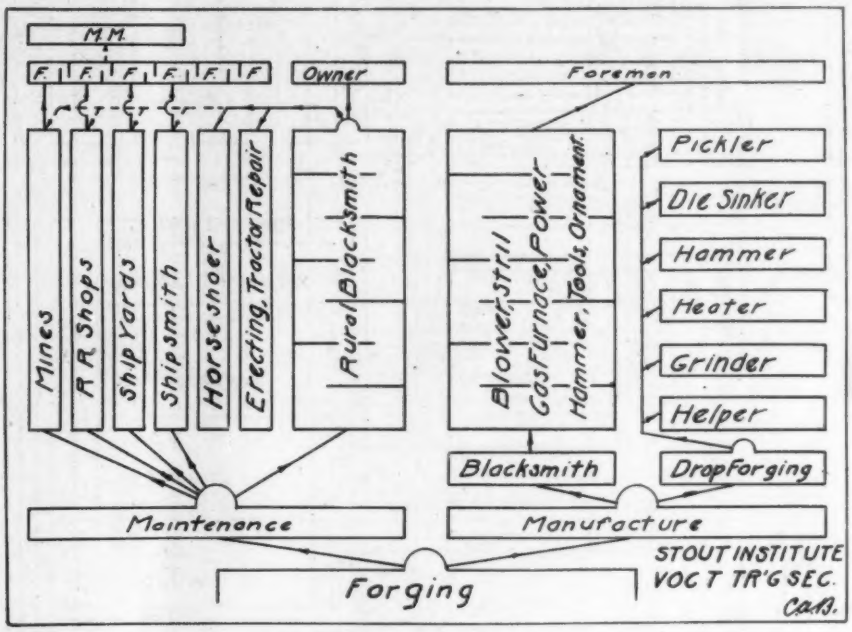
smithing or may enter directly into one of the special kinds of blacksmithing. Work of the rural blacksmith is of a general trade experience nature and may lead in two directions. He may become owner of the shop or he may go into one of the special kinds of blacksmithing. He is most likely to go into the first two, horseshoeing, special work, or erecting and tractor repair. There is possible, but not probable, travel into the other special blacksmithing fields. Positions in a specialized blacksmithing field may lead to foremanship



and possible but not probable, entry into work as master mechanic.

Each of the rectangles indicating trade work represents a large amount of trade analysis, with some elements common to them all. In planning a course in forging, the classification of the pupils taking the course is necessary, with reasons for taking, future fields open, etc.

The printing and publishing chart is a classification based on trade groups and is for use in connection with studies of occupational fields in this work. It is presumed that the students will use the chart to best advantage after some experience in printing. Related studies by junior and senior high school students are aided in having graphic material available.



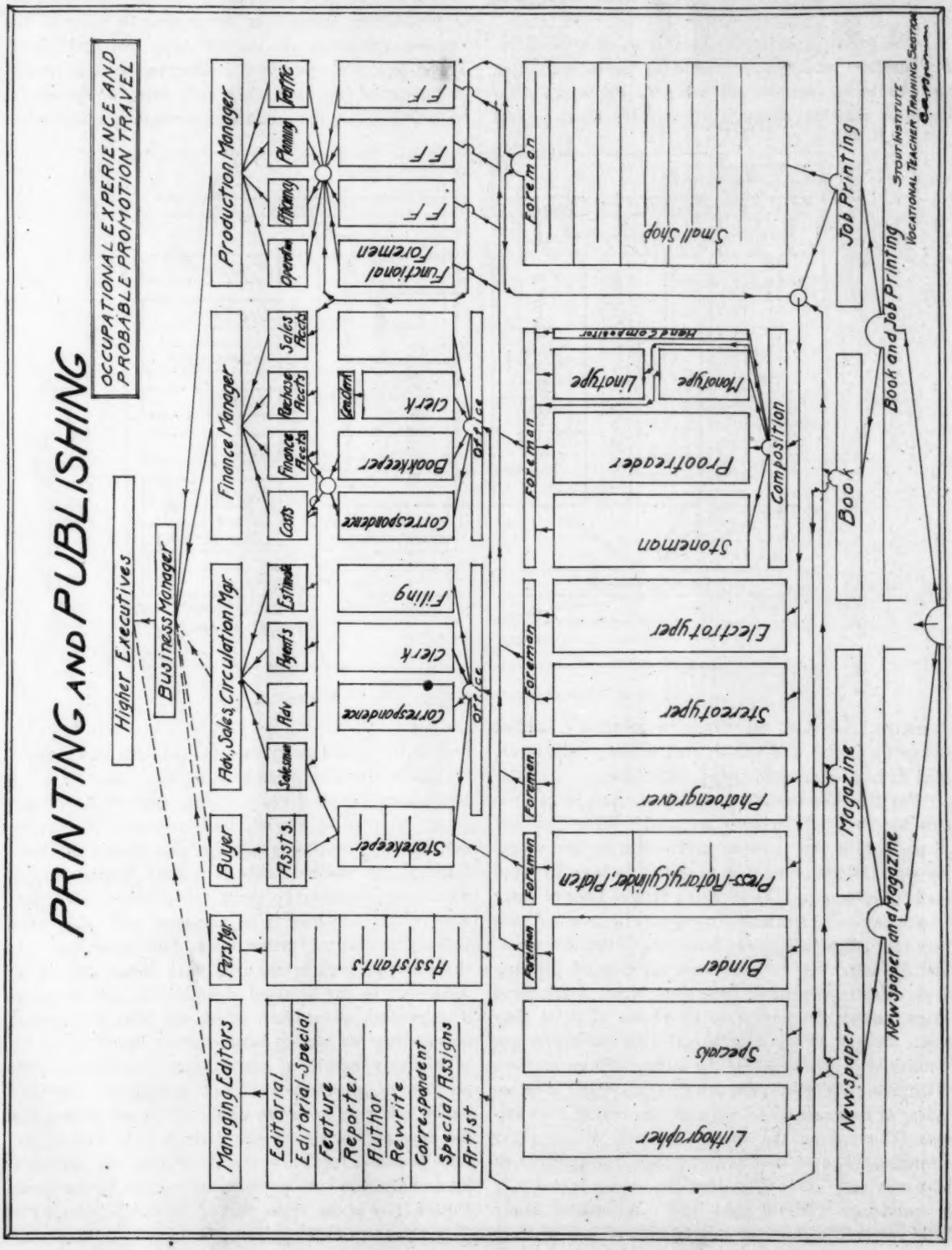
A Detail Chart Showing the Opportunities in Forging.

For the purposes of this study the two large divisions and four sub-divisions are used. With book and job printing in one division and newspaper and magazine work in the other it is necessary to keep in mind possible overlapping. In studying typical lines of entry for occupational experience travel, it will be noted that entry into job printing may be in one of two directions. First, the entry may be into the small shop job printing which consists of general experience of an interlocking nature, taking the worker to all phases of print shop work. Second, entry may be into the large printing establishment in which case the worker will go into one of the sub-divisions of the printing industry. For instance, in composition he may go into one of the divisions indicated on the chart. In each of the other rectangles indicated on the chart in the mechanical work entry may very likely mean that the worker learns only the particular work of that field. A detailed study would result in a chart for the contents of each of these rectangles representing occupations in the printing industry.

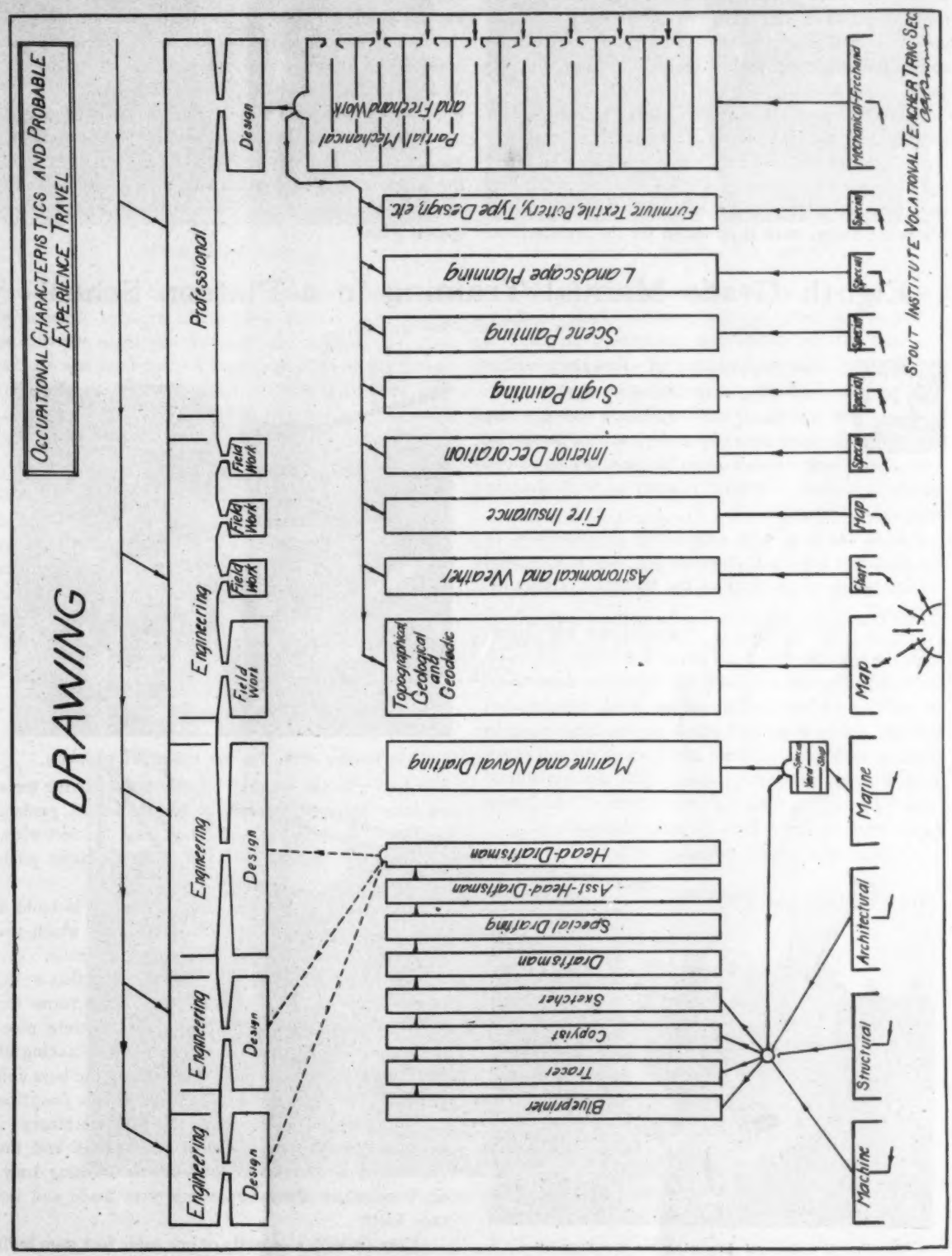
In studying lines of travel from the mechanical trade experiences it is noted that in the small shop job printing travel is in two directions. First, the workman may go to the specialized work in a large shop and second, he may go towards the under-executive positions in production, finance, or advertising or sales in the business operating in the printing and publishing. Travel from the specialized mechanical work is usually to functional positions when such exist, or specialized foremanships, in the production division of business operating.

In the initial entry into the printing and publishing fields there is possible immediate entry into the business operating division. This entry will probably be as indicated in the editorial, personnel if such exists, buying, advertising or sales, and finance divisions. Each of the possible fields of business opportunity in which individuals may make initial entry have some work which may lead to advancement and some which is likely to lead to further work of its same kind. In the editorial work at the left, work is not sharply divided due to the personal element. In the personnel management, where such exists, the work of assistant may or may not lead to advancement, depending on the interlocking nature of the business experience. The position of storekeeper, if not specialized, may lead either to buying or to the sales. In the advertising and the sales and in the finance division it is noticed that some positions furnish work only of their own particular kind and others have positions of possible advancement. Dotted lines at the upper part of the chart indicate possible but not probable advancement.

The chart of drawing is a classification based on a particular kind of work (drafting) indicating the general fields of occupations in which draftsmen are used. The school relation is suggested. The three general divisions at the left with parts of marine drawing, call for the usual positions in the drafting field. If an individual enters this field directly without school training, and sometimes with limited school training, he may enter one of the four positions indicated at the left. He may take them in the order listed or he may not work in all four of the fields. Subsequent advancement will probably be in the order indicated.



Beginning with marine drawing we find a series of occupations calling for special drafting work. Marine drawing will probably keep the worker in this field. The series of special occupations call for drafting adapted to each particular field with a decreasing proportion of mechanical and an increasing proportion of freehand work in those fields indicated to the right. Continuing we find a general field indicated, calling for some mechanical drawing and some freehand. This field may be entered from a great variety of levels of degree



of training. The experience in this field cannot be definitely listed because of the dependence on "temperament". The requirements vary in the proportion of mechanical and of freehand drawing, the positions being in commercial design, advertising, etc. Occupational experience travel from this general field at the right of the chart, may be in two directions. Individuals may go from this general field into any one of the specialized kinds of work indicated, or may go into designing.

At the top of the chart with entry indicated from university or special training are a number of engineering and professional fields. Design being such an interwoven part of engineering it is not sharply divided in the three divisions at the left. In the engineering where the design work is indicated for the architectural and marine it is in recognition of the tendency to classify the marine design with certain phases of architectural work.

The engineering work related to the first four of the special occupational groups calling for drafting is largely field work rather than design. It is as intimately connected with the work of the engineer as the design and is distinctly the work of the trained executive as set apart from the work of the draftsman. At the extreme right is indicated that field of executive work which while on an equal plane with the engineering in many ways, does not necessarily call for engineering training. Entry into this field may be made from the interlocking field of general drawing experience indicated on the right of the chart or from university or special school.

Eighth Grade Manual Training in a Platoon School

Lewis D. Cooner, Pittsburgh, Pa.

NO other organization of elementary education affords the opportunities of project development as does the platoon school, where the operations of one department, instead of being isolated as in the traditional school, have at all times a definite relation to work done in some other department.

This has been very successfully demonstrated in the McKelvy School, Pittsburgh, Pa., and a very good example exists in the work of the Manual Training department.

Under the direction of the instructor the department has correlated with the community room, by building toys and equipment; with the expression department by building scenery and properties of all descriptions; with the nature study and school garden department by building seed flats, markers, plant boxes, animal cages, window boxes and cold frames; with the community "store" by building shelving and counters. Considerable repair work has been done for other departments.

One of the largest projects, carried on by eighth grade boys, was the building of a house for storing tools and other necessary equipment for the school garden. The size of the house is twelve feet long, ten feet wide, and seven feet high at the eaves, with a quarter pitch roof.

Leveling the Site and Preparing for the Foundation.

The Pouring of the Concrete Foundation Completed.

On account of location it was necessary to build a six-inch concrete wall, three feet high, upon which the frame work was built. The floor is also concrete.

Considerable grading was necessary and that work, the making of the plans, the building of the forms for the concrete, mixing and pouring of the concrete, placing of sills,—everything, in fact, except the making of its one door and window sash was done by the boys and by hand. The door and window were bought from the mill as the McKelvy school does not have machinery.

The instructor made the original sketch and the boys worked out the details and made the working drawing, from which the specifications were made and the house built.

Carriers with a capacity of one cubic foot were built

Putting Up the Frame.

Ready for Sheathing and Roofing.

for convenience in handling and accuracy in measuring the concrete mixture. The value of various mixtures for different needs was discussed and applied. A 1:2:3 mixture was used for the walls and floor of the house. About the time the floor and walls were finished cold weather set in, and outside work was discontinued until spring.

During the winter, together with other school projects, the frame work was made ready in the shop; sill, studs, plate, rafters, ridgepole, door frame and window frame were made ready to put up when the weather permitted. Early in the spring, the framing was done, door and window frames set, sheeting and siding put on, door hung window put in and the finish put on. The roof was shingled with cypress shingles. Three coats of paint were applied.

The eighth grade boys who did the work have three periods of ninety minutes each per week in the Manual Training department, and about half the time of two semesters was used on the house.

The rough material for the house was purchased direct from the wholesale dealers and cost about $210. The house is now in use and the pride of McKelvy School and the envy of every other school garden in Pittsburgh.

Not the least interesting feature was the effect it had on the relation to the homes of the boys. Concrete steps were made, cellar openings put in, walls repaired and new ones built by various members of the class.

Surely a problem of this kind has a practical value for the boys who ranged in age from twelve to fourteen years.

Building as Completed and the Boys Who Did the Work.

FREE HAND DRAWING AND INDUSTRIAL ART

Prof. Edward J. Lake, University of Illinois

VASARI tells us that Giotto drew a perfect circle with one sweep of his skilful brush and sent it to the Pope as evidence of his ability to undertake great commissions of state. If Giotto, as a pupil in a modern drawing class, had drawn a perfect circle with one sweep of his brush to impress his teacher, the teacher might have called in a vocational expert and they might have decided that the precocious lad would make a great success on the vaudeville stage, *but not as a great artist.* In the judgment of the modern drawing teacher, dexterity and artistic conception are unrelated, or at variance. The modern drawing teacher has become a teacher of art.

He believes, with reason, that significant drawing is of the head rather than of the hand. He believes, with reason, that, unless significant conception is in mind nc significant results can be secured. He believes that mental conception is of great and important educational value, and that drawing is a means to the end of developing mental conception of visual things. Vasari also tells us that the precocious Giotto painted a fly so lifelike that his master was deceived and tried to brush it off.

The modern drawing teacher has convictions that condemn such deception as inartistic. He asserts, and with reason, that it is not the part of art to deceive by making things look like nature. He stresses the value of individuality in art. He asserts that a copy of nature is not original, and that a work of art must be. For example, he compares the Tussaud collection of wax figures in London with the Greek marbles in the London Museum. The wax figures deceive the visitor by their horrible naturalism; the Greek marbles are the result of a beautiful conception, and deceive no one, whether he can interpret the conception or not.

Whatever may be the causes aside from these convictions of the modern drawing teacher, no one can deny that the modern drawing teacher has failed to teach drawing. The graduates of our colleges and high schools cannot draw even simple forms to express simple conceptions of design. Now comes the particular need of such ability, with stress laid upon the industrial arts. It is evident that we need not less, but more art instruction. It is evident that art is important in the education of every individual. It is evident that drawing, thru its expressive interest, as well as thru its application to design, must and will persist as a school subject. How can we, as drawing teachers, meet the demands of industrial art so that pupils who have passed thru our schools will be able to make use of drawing as a means of expression in design?

First we may well adopt a simple creed which will embody our convictions and purpose. This creed will not violate the convictions of any experienced drawing or art teacher who has taken the subject under serious consideration.

1. We believe that drawing is the best means of developing and expressing thought thru form.

2. We believe that thought expressed thru drawing provides the best means of working out problems of construction before they are executed in material.

3. We believe that standards equal to the standards reached in other school subjects can be reached by students of drawing.

With this creed before us it will be well to consider certain definite impressions to be developed and expressed by the process of drawing.

Effects are represented in direction, contour, proportion, shape, mass, tone, texture, and color, and in the combination of these which we call composition. Design is the composition of these elements of form for a definite purpose. It is evident that a very simple form may involve many or all of these elements. It is also evident to the teacher that the ability to conceive these elements is not alike in individuals. Most children recognize the contour or line, and fail to recognize mass and proportion. There is a natural inclination to think of small, unrelated parts, failing to realize the relation of these parts to the whole object or subject. The burden of development in all subjects of education is alike in the need of synthetic conception. The discourse that wanders from Genesis to Exodus and notes unrelated incident without unified impression is most common. Clarity of thought depends on unity of conception.

It has been the common practice of modern drawing teachers to consider mass as the most important element of form for emphasis to beginners. Soft mediums by which shape could be expressed, and by which detail could not be easily represented are used. This is logical in the impression of mass, and the impression of mass is a most important impression; but in the persistent impression of mass, the modern drawing teacher has neglected to develop the important element of *direction.*

In the way of impressing direction the old-time drawing teacher insisted on the laborious drawing of vertical, horizontal, and diagonal lines. The modern teacher has discarded this arbitrary practice as drill without impression or expression. The results are not encouraging. The attempts at drawing by a modern high school student are, above other things, likely to stand seven ways on the paper. More attention is evidently necessary in our drawing to that characteristic "squaring the stock" of the manual training teacher. It is evidently impossible to represent direction without

standards. The standards must not only be evident, but they must be *conceived and used.*

A rectangular sheet of paper set diagonally on the desk offers great difficulty in representing direction. The experienced draughtsman *squares himself* with the surface on which he draws. If the stroke is to be vertical he places himself directly *in front of the stroke,* and draws from the top downward, taking advantage of gravity in the drop of the hand. If the stroke is to be horizontal he again places himself square with the drawing surface and draws *away from the body with a full arm movement.* Such methods should be insisted upon by the drawing teacher.

True direction, so necessary to lettering, has made it customary to sketch guide lines over the paper. The same method may well be used in drawing. Cross-sectioned paper is advisable for the pupil who is careless of direction. With most pupils a sense of direction is not lacking, but if response to that sense is not insisted upon in the class exercise the result is a careless habit of indifference to direction.

Direction is a symbol of life, action, and repose and should be constantly emphasized. The direction of leading lines in a form is to be noted and recorded as a first step in the representation of it. Does the form stand erect, or is it out of balance? Does it express motion? Evidently the element of direction as expressed by line is so essential to drawing that the draughtsman must become especially keen to secure the control of forms governed by structural lines. Many of these structural lines are not visible in the model. They control the form only in the mind of the draughtsman who conceives them. The midrib of a leaf, the bole of a tree, the spine of every living creature, offers a line the direction of which controls the drawing and makes it possible.

We hear of three socalled methods of drawing: first, the caligraphic method, in which sweeping lines are used with a movement that registers action and character. A method to be used in the register of undulating forms. A method that, persisted in, will result in the recognition of grace and movement in certain forms, but that will give little sense of that structure and stability represented in geometrical shape and constructed form. It is the method of the pen writer and of the engraver who can render graceful lines with elaborate flourish. Apparently it is not a method adapted to the drawing of structural forms. Second, the oval or transitional method which builds up forms with particular attention to modified structure. We observe this conception in the sketches of Raphael, whose graceful Madonnas are composed of ovals laid together with a movement that is transferred from one yielding mass to another, and held together by an inclusive oval form. Third, the structural method, which reduces the form to its simplest structural planes and angles. This method has become most common in the modern practice of drawing. It has been exaggerated in some modern drawing to a forced emphasis on blocked planes, so that some of our illustrations look cubistic in their rugged and abrupt form.

Which of these methods shall we employ? Each of them, as occasion demands, and no one of them exclusively. We must train our pupils to recognize the character of form and adapt our method to the best expression of that character. As a first injunction, let us give more *attention to direction.* Shall we revert to the old time method of drill in direction by drawing lines that have no meaning? No! but *we must have the drill.* The drill must be made necessary to exercises in drawing that have meaning, use, and interest. How better can we do this than to have our pupils design simple things that involve lettering and simple illustration? The poster; the announcement of school events; the title page; the covers for booklets, and simple exercises in construction, all offer *drill in direction* that can be given with interest and meaning. The idea of design insures interest. Drawing involves design. Design involves drawing. The two need not be considered separate in school work. The same exercise can be made in part of paper cut forms, and in part of drawn lines in which the same *drill in direction* that the old time teacher exacted of his pupils can be given with interest and meaning.

It is expected that children of the grades learn to tell time by the clock. They may learn to read angles and acquire a sense of direction from horizontal and vertical standards by reference to the clock face. A circle divided into six parts of sixty degrees each is a geometrical problem of some difficulty, but a paper or clay pie cut into six pieces is a first grade exercise. The pitch of a roof is an important element in architectural design, yet grade children can be led thru drawing to recognize the effect and purpose of pitch in shelter from the Indian tepee to the flat roof of the adobe hut.

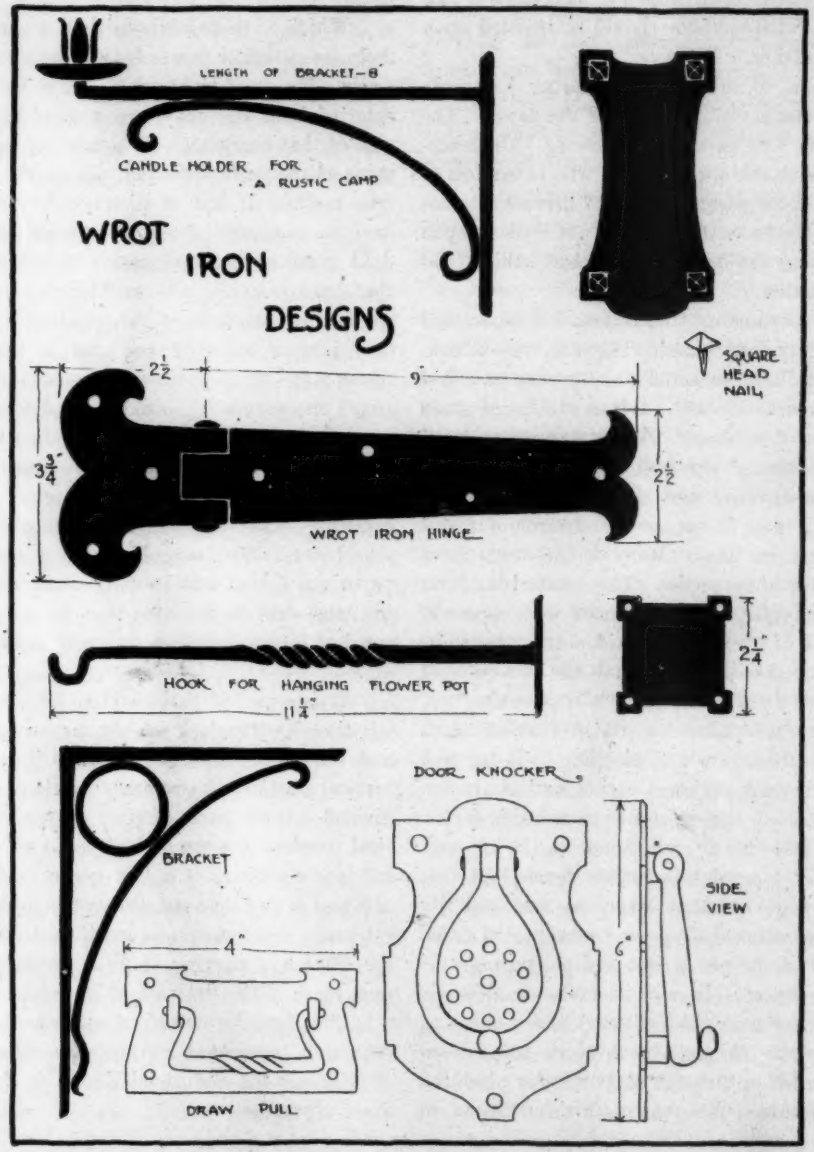
The literal interest of our drawing exercises has been well considered. What we need most in the way of training for industrial design is drill in habits of exact expression.

The Western Arts Association will hold its annual convention at Detroit, Mich., May 4, 5, 6 and 7. Mr. Harry Wood, of Indianapolis, will preside. Secretary L. R. Abbott, of Grand Rapids, Mich., may be addressed for full information concerning the details of the meeting.

BEAUTY IN IRON

C. H. Richert and Otis Philbrick, Rindge Technical School, Cambridge, Mass.

IN a technical school the creative influence of the freehand drawing room should be felt in every shop. The connecting link between the forge shop and drawing should be especially strong. Pictorially the blacksmith has always been associated with artistic things but the and their good appearance depends so much upon the taste used in designing them, that the artistic viewpoint is essential and cannot wisely be ignored. It is particularly satisfactory that the finished piece of wrought iron resembles so closely the simple brush and black ink design from which it was made. In forgework the



DESIGNS IN IRON FOR SCHOOL SHOP.

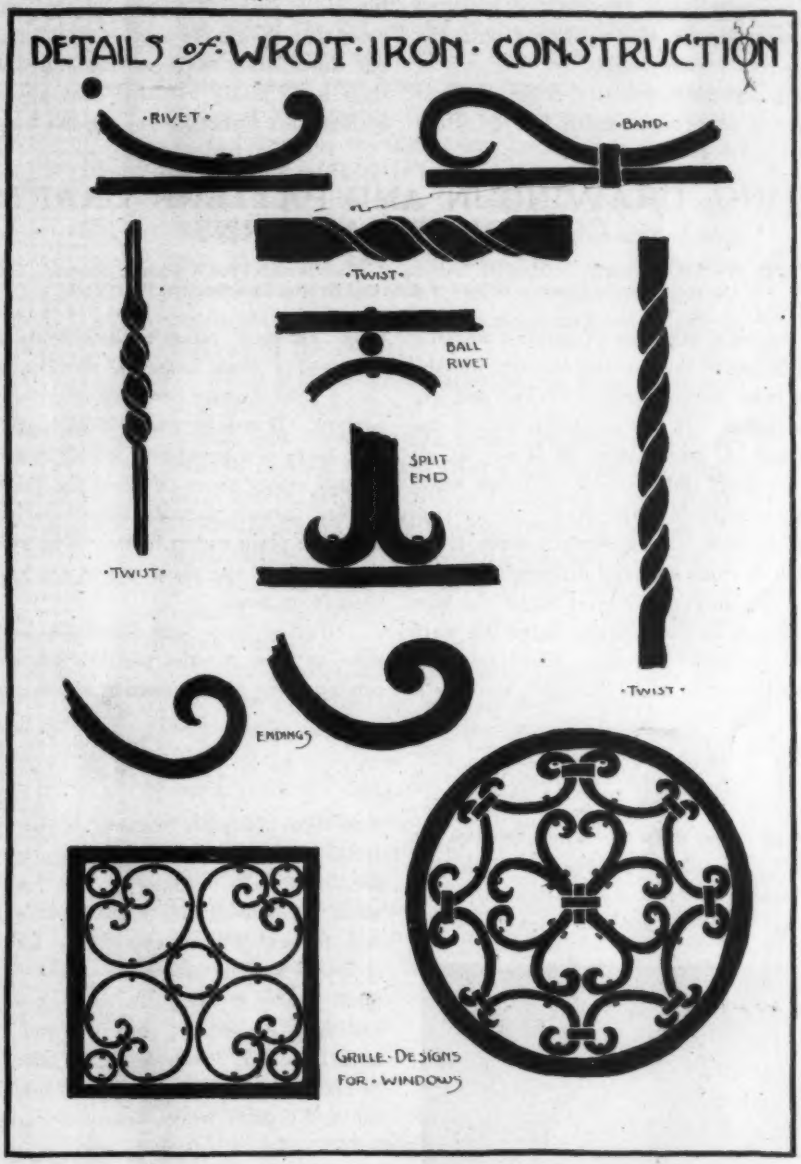
actual working of the metal is, or can be, also of a real artistic nature. The good smithy is usually very appreciative of and eager to meet, the designer because he realizes that good execution cannot make up for poor design. In his work more than in almost any other craft, the actual shapes of the metal stand out so clearly, heating and shaping of the metal, the drawing out of a given size into different shapes, lengths and widths depends so much upon the team work of hand and eye and brain that, as in drawing, the boy's judgment is tremendously developed. That is education. And again a boy working in the forgeshop cannot help but absorb

an appreciative feeling for the character and beauty in a thing that is hand wrought and looks hand wrought. This in itself is very much worth while because it tends to offset the present day devotion to the highly polished and mechanically perfect machine-made product.

Before attempting to design wrought iron, enough must be known about the construction to realize the possibilities and to recognize the limitation of the material. The underlying principles of construction are very simple and can be easily assimilated. We have found it very much worth while to have the different pieces shown in the details of construction actually made in the forgeshop, fastened to a white board and hung on the wall before the class in design. All of the objects shown in the illustration were designed in the freehand drawing room and were made in the forgeshop of the Rindge Technical School at Cambridge, Mass. The designs were chosen for their simplicity and usefulness and for their being well within the scope of a boy's ability. Only the vital dimensions are given. The sizes should be varied according to their purposes.

Wrought iron is elemental and the designs for it should be kept simple and elemental. Avoid complicated shapes or floral embellishments of any sort that tend to conceal the fact that it is wrought iron. It has a simple rugged beauty of its own and should not be made to resemble any other material.

Sketch the designs in first with pencil and paint them in directly with brush and black ink, leaving white lines to separate the different pieces of iron. Rivet



DESIGNS WHICH CAN BE MADE IN THE SCHOOL SHOP.

heads and bands should be shown clearly as they make the design easier to understand and more attractive. Avoid "stringy" designs due to using iron too thin for the problem.

It is important to impress upon the class the difference between wrought iron and cast iron. This will avoid many mistakes in construction.

The maxim "Beauty is its own excuse for being" does not apply to wrought iron. It must first of all be practical. Any ornamentation that interferes with the usefulness of the object is poor design.

When the iron has been actually made up then comes the question of the proper finish for it. Here again is need of the designer's taste and judgment. As a general rule there is nothing better than black and nothing more in keeping with the character of the iron. Sometimes green or brown may be used discreetly.

Iron for outside use will rust if not thoroly painted with oil paint and kept painted. One of the beautiful gates around the Harvard College yard has been ruined because of lack of paint. A coat of red lead underneath the black paint is advisable. No one article can do more than give a few simple samples and hint at others but the relation between freehand drawing and forge-shop is so nicely balanced that any school possessing both is most fortunate and capable of great possibilities.

WRITING, DRAWING-IN AND PATTERN DRAFTS OF COVERLET PATTERNS

Louis H. Walden, Instructor in Manual Training at The Norwich Free Academy, Norwich, Conn. Instructor in the Summer School of Arts and Crafts, Chautauqua, New York.

MANY beautiful examples of coverlet weaving are to be found thruout the country, but the drafts have been destroyed or lost and are not available. If the sample is not in too bad state of preservation it is not at all difficult to write the draft and everyone who does weaving should be able to reproduce it.

Before going farther let me explain some terms which I shall use and which are used differently by different people. By the term "heddle" I mean the wire or string having an eye at its center to carry the warp thread; this is called a heald by some. The frame that carries the heddles I refer to as a "harness", tho this is known as a heddle, leaf, shaft, and when string heddles are used, heddle sticks. Harnesses are numbered from back to front, 1, 2, 3, 4, the order in which the warp approaches the worker. The "shed" is the opening between the two parts of the warp when any treadles are down. I shall use the same term to indicate the threads which pass thru these openings and shall name them by the numbers of the harnesses sunk to open the wrap, thus, "1-2 shed" refers to the threads in the shed formed by pressing down harnesses number 1 and number 2.

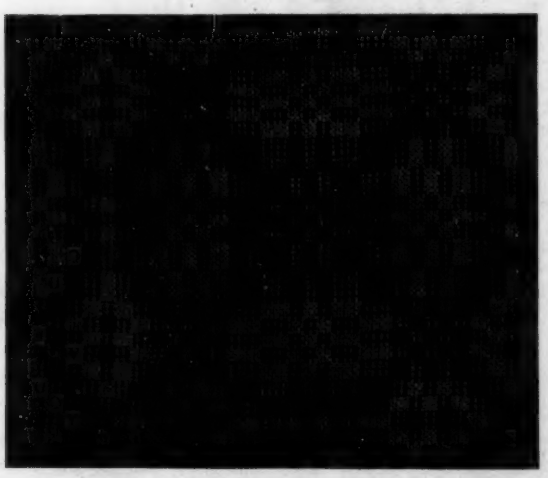


Fig. 1. Sun, Moon and Stars Pattern.

I shall discuss here only the four harness coverlet pattern. It will be found in all these coverlet patterns that there is a ground of woven cloth with the pattern threads either above or below the surface, so that if the pattern threads were all cut away there would still remain the plain woven fabric. The weft threads or filler that produce the plain weave are known as the tabby threads or binder.

Having then four harnesses and using two at a time, as these coverlet patterns do, we have six possible combinations of harnesses or sheds, thus:

1	2	3	4	
•	•			1 — 2
•		•		1 — 3
•			•	1 — 4
	•	•		2 — 3
	•		•	2 — 4
		•	•	3 — 4

And these sheds are opposite in pairs, that is, 1-2 shed is the opposite of 3-4 shed, since all the threads that are down when harnesses 1 and 2 are sunk will be up when harnesses 3 and 4 are sunk, and so 1-3 and 2-4, and 1-4 and 2-3 are opposites. Any of these pairs of opposites may be used as the tabby pairs to produce the plain weave ground. To me 1-3, and 2-4 seem to be the most convenient, tho 1-2 and 3-4 are very frequently found. Care should be taken in using patterns to know which pair is used. Dropping 1-3 and 2-4 for the tabby pairs leaves four sheds for the pattern, 1-2, 2-3, 3-4, 4-1, a complete cycle.

The pattern shown in Figure 1 is a good example. It bears the name "Sun, Moon, and Stars." The name very rarely has any connection with the pattern, and often patterns having the same name vary considerably. The same pattern is known by different names in different parts of the country.

Any cross section paper, or as it is often called squared, or checked paper, with about eighth inch squares is suitable for writing drafts, but that which is cataloged as 8x8x1, meaning eight squares each way to

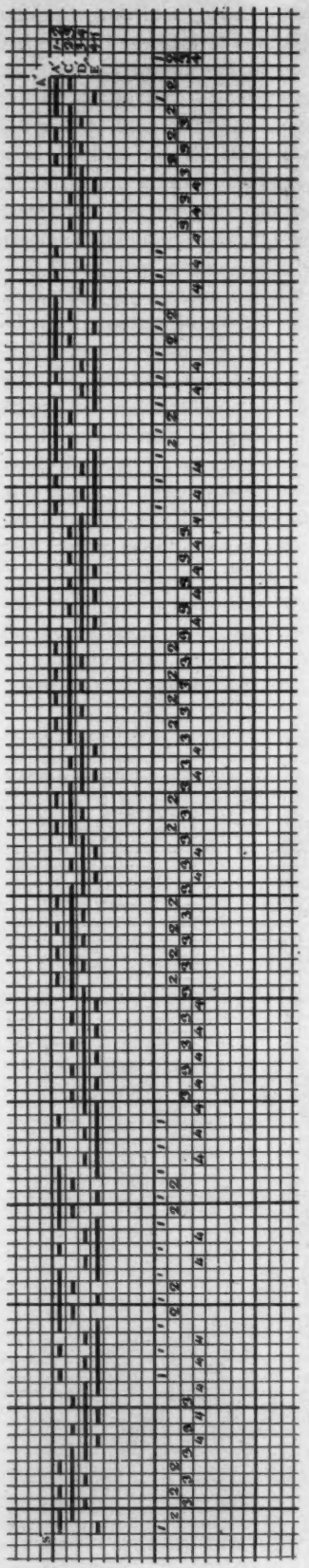


Fig. 2

the inch, and every inch line heavier and darker in color, is much easier to follow.

In this sample a complete repeat of the pattern is from R to S, the weft thread running horizontally. The small block below R and at the left of A is the best place to start the pattern as it is the beginning of the figure. In this block the overshot covers five warp threads and it is best to commence with the thread at the left of the pin, as this is the center thread of the block. Counting from the pin toward the left, the color thread passes over three warp threads. This can be followed by watching the threads in the shed marked C, and counting the thread that the overshot of shed A and the overshot of C have in common. The shuttle thread then passes under the fourth warp thread, over the fifth, under the sixth, over the next, under six, over one, under one, over one, under one, over five, under one, over one, under one, over five, and so on until we reach the second thread of the block under S, which is the end of the repeat.

This is shown on the cross section paper in Figure 2 by letting each vertical row of spaces represent a warp thread, and drawing a line across each space that indicates a covered thread. Thus a line crosses the first three spaces, skips the fourth (to denote a thread not covered), crosses the fifth, skips the sixth, crosses the next, skips six, crosses one, skips one, and so across to S' when one complete repeat of the shed has been charted. The sheds C', D', and E' are treated in the same manner.

Since there are three pairs of opposite sheds, and one pair (1-3, 2-4) is assigned as the tabby pair, it follows that two of the pattern sheds must be the opposite of the other two. Compare shed A' with shed D', and C' with E'. Where there is an overshot in A' the same warp threads are uncovered in D', and those covered in C' are uncovered in E'. This makes a good check of the copying. If one is sure of copying accurately, it is possible to copy only two sheds which are not opposite, and this means any two consecutive sheds as a rule, and fill in the other sheds from these two, making the third opposite to the first and the fourth opposite to the second.

Sheds 1-3 and 2-4 having been assigned to the tabby, any of the other four harness combinations may be used to produce the shed A'. It is natural to assign 1-2 since that combination comes first in the list. Then shed D', which is the opposite of shed A', must be made by sinking harnesses 3 and 4. Shed C' may be formed by either 2-3 or 4-1, and it is natural to assign 2-3 since that combination comes between the ones already used, 4-1 then will form shed E'.

Following the vertical row of spaces representing the first warp thread R', it is found to be covered in shed A' and in shed C'. This first thread, then, is covered and therefore sunk when harnesses 1 and 2 are pulled down, and when harnesses 2 and 3 are pulled down, and since harness 2 is down both times the first

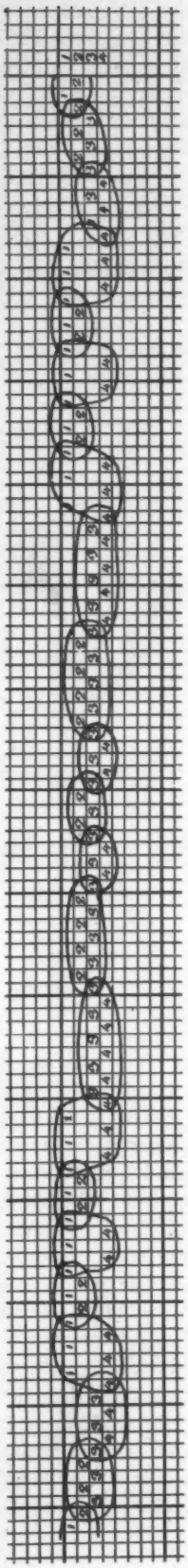


Fig. 3.

thread is controlled by that harness. There are several ways of indicating this in the draft. Figure 4 shows some of them. The one at R is perhaps the easiest to follow. In this each thread is marked with the number of the harness to which it belongs, and, each horizontal row representing a harness, is placed in its harness, leaving little chance for confusion. In C, D, and E the position in the harness is shown but the number

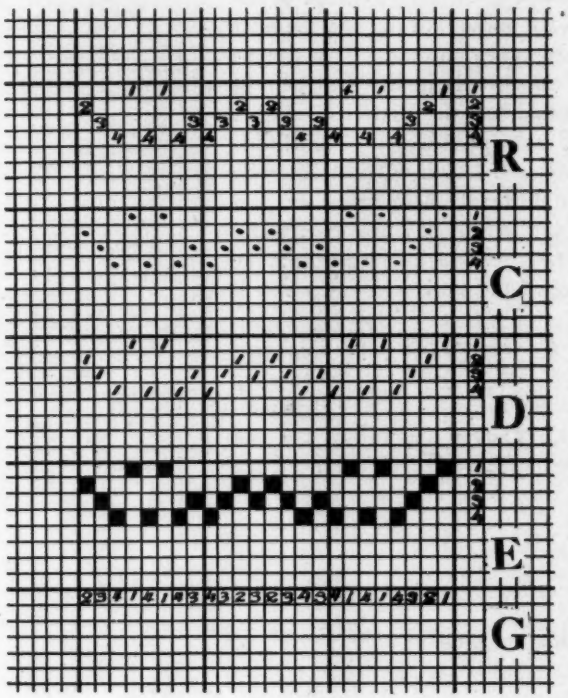


Fig. 4.

of the harness not being marked, there is chance for errors in following a long draft. In G the number of the harness is given and not the position, and this one line of figures is a bit difficult to follow. Since the first warp thread is controlled by harness 2 this is indicated by placing a figure 2 in the vertical row representing the warp thread and in the horizontal row representing the second harness. The second warp thread is down when 1-2 and 4-1 are down and so is in harness 1, the third thread is in 2, the fourth in 3, the fifth in 2 and so thru the draft. This arrangement of the threads indicating the proper harness for each one is the drawing-in draft, for it is from this draft that the threads are drawn into the harnesses when setting up the loom. Since the odd harnesses 1 and 3 produce one shed of the tabby, and the even harnesses 2 and 4 produce the other shed, alternate threads in the draft must be odd and even. This provides a check on the drawing-in draft for two odd or two even threads coming together shows a mistake at once. This applies only when 1-3 and 2-4 are the tabby sheds.

Having the drawing-in draft, the order of treading must be determined. In Figure 3, which is the same draft repeated, the first combination of harnesses appearing is 1-2. A section of a ring is drawn enclosing all the consecutive 1's and 2's, this ring being left open as the draft started in the middle of the block and the ring to be complete should contain the 1's and 2's from the end of the repeat. The next shed is 2-3 and all the consecutive 2's and 3's are enclosed by a ring, then the 3's and 4's, the 4's and 1's, the 1's and 2's, and so on. Note that each ring has on thread from the ring before, this is due to the lapping of the blocks in the pattern. The order of treading will be 1-2, 2-3, 3-4, 4-1, 1-2, and so on. The number of times each shed is used depends upon the size of yarn used for the color, the size of yarn used for the tabby, and the closeness of the warp threads, but the average number may be obtained from the draft. Thus the shed 1-2 occurs two and a half times (counting the beginning and the end of the repeat) and the shed would be used either two or three times, probably three, and written 1-2-3, 2-3 occurs three times and so would be used three times, 3-4 occurs three times and is used three times. The complete treading list for this pattern would be:

1—2—3
2—3—3
3—4—3
4—1—3
1—2—3
4—1—3
1—2—3
4—1—3

In the illustration a rather fine color yarn was used and a very fine tabby thread so instead of using 1-2 being repeated three times it is used five times, 2-3 five times, 3-4 five times,

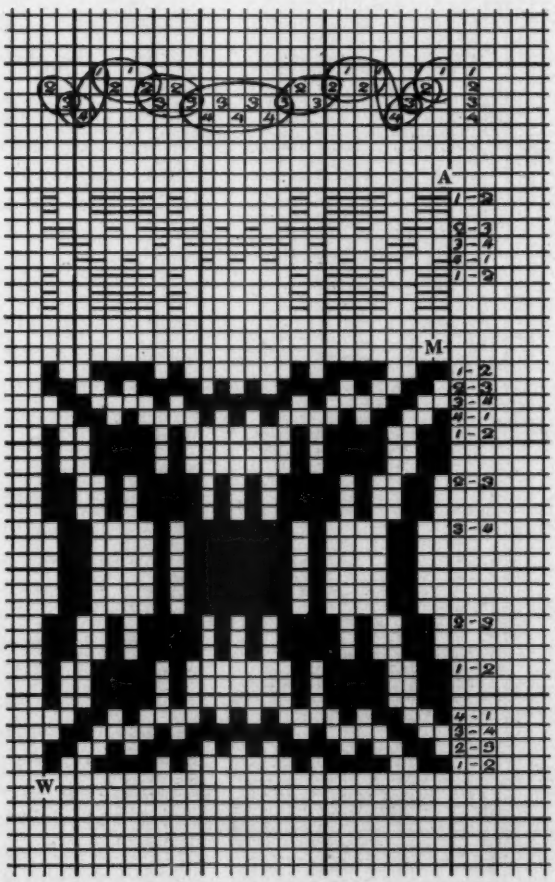


Fig. 5.

3—4—5
2—3—5
3—4—3
2—3—3
3—4—3
2—3—5
3—4—5
4—1—3
1—2—3
4—1—3
1—2—3
4—1—3
3—4—3
2—3—3
repeat

4-1 six times and so thru the sample. A very large color yarn might require only two instead of three and the other numbers to correspond. Careful examination of Figure 1 shows there is a diagonal formed by the overlapping blocks from the corner of the figure at R to the opposite lower corner. If this diagonal is kept perfectly straight and at an angle of forty-five degrees, the figure will be correct. To do this it is necessary to make each block on this diagonal one thread less than square. This will determine the correct number of times to repeat each shed for the particular sizes of yarns being used.

A little experience in making drafts from patterns will soon enable one to write the drawing-in draft directly from a sample, working from only two sheds, any two that are not opposite.

Thus in Figure 2, considering only sheds A' and C', the first warp thread is in both sheds and belongs to harness 2, the third thread is the same. If then, the thread is in both sheds it belongs in harness 2, if in the first shed only of the two, as is the second warp in the figure, it is in harness 1, if in the second shed only it is in harness 3, and if it appears in neither shed it is in harness 4. This can be followed directly from the sample as well as from the drawing. However, until one is perfectly familiar with writing drafts it is better to copy the four sheds and make the drawing-in draft from the copy.

Often the pattern draft is desired when only the drawing-in draft is at hand. It is not difficult to make, and shows at once what the pattern is, and saves setting up the pattern in the loom to know if it is pleasing, while the drawing-in draft alone gives little idea of the pattern.

Take as an example the drawing-in draft in Figure 5 and the order of treading from it:

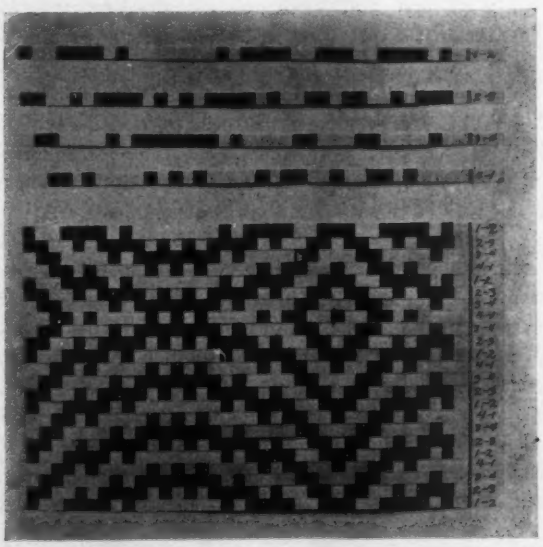


Fig. 6. A Paper Draft of Pattern in Fig. 7.

Fig. 7.

1—2 3—4
2—3 2—3
3—4 1—2
4—1 4—1
1—2 3—4
2—3 2—3

The first shed is 1-2. Starting at A draw a line covering all the spaces representing threads in harnesses 1 and 2, this shed is repeated until the first block is one thread less than square. The next shed is 2-3 and all spaces representing threads in harnesses 2 and 3 are covered, and again the lapping of the block of the first shed at A is made one thread less than square, and so through the pattern using each shed in the order it occurs in the treading list, and repeating it enough times to make the blocks on the diagonal each one space less than square. The lower part of Figure 5 shows the entire square blackened instead of a line across the square. Altho considerable more work this makes the pattern stand out very much more distinctly. Two repeats of a small figure are often desirable to show the relation of the figures to each other. The lower border of Figure 7 shows the pattern just discussed.

Very attractive and interesting designs may be produced by using different treadings with patterns, particularly those having small figures. The pattern in Figure 5, known as the "Honeysuckle Pattern", is very adaptable. The original figure shown in the lower part of Figure is in itself very attractive. The other designs in the Figure are produced by different treadings of the same pattern. The order of treading for the second from the bottom is:

		For the third	And the topmost one:
1—2		3—4—1	border: alternate color and white
2—3	repeated	2—3—1	four times in tabby sheds
3—4	three times	1—2—2	3—4—4
4—1		4—1—2	2—3—4
1—2		3—4—2	1—2—4
2—3		2—3—2	2—3—4
3—4		1—2—4	3—4—4
2—3		2—3—2	alternate color and white
1—2		3—4—2	four times in tabby sheds
4—1		4—1—2	body: 3—4—7
3—4	repeated	1—2—2	2—3—3
2—3	three times	2—3—1	1—2—3
1—2			4—1—to desired length
			1—2—3
			2—3—to desired length
			1—2—5
			4—1—5
			repeat first border

These changes may be drawn out on paper, after similar manner of making the pattern drafts, to see the results of various combinations of treading, but a very easy way is to make slips of paper like those shown at the top of Figure 6 representing the different sheds. These should be marked with the harness numbers and also in such a way that they may be properly matched. The lower part of Figure 6 shows the second design of Figure 7 partly arranged with these strips. It is very easy to make the list of the shed numbers and reproduce the design on the loom. Care should be taken not to use opposite sheds together in a design, as doing so will break the continuity of the lines. Occasionally, however, opposites may be used alternately when the overshots are not too long to produce interesting grounds; in such cases a tabby thread is usually unnecessary.

TEACHING MECHANICAL DRAWING EFFECTIVELY

Charles H. Sampson, Boston, Mass.

To begin with—isn't teaching mechanical drawing, teaching one to do more than merely draw? Is a student "finished" in this subject at the completion of his course if he can merely produce a good-looking, properly dimensioned drawing? I certainly think he is not.

It seems to me that too many teachers of mechanical drawing are satisfied if they teach those under them to copy instead of draw. Isn't that what it really amounts to? I sometimes think that the teachers are "fooling" themselves in this respect because I well remember that in my earlier days of teaching I was sure that I was doing the very best thing for my students when I gave them actual working drawings to copy and I was highly pleased when I saw the final results. I had made them good copyists; they secured good positions as tracers if such positions can be considered good; I simply made them imitators and had really done no more than just that.

I am convinced after twelve strenuous years of teaching, much of which has been spent in arranging and writing courses of technical content, that we are somewhat inclined to neglect the fundamentals. I believe this to be as true in the teaching of drawing as in other more important subjects. What then, you may well ask, are these fundamentals of mechanical drawing which are so important as to require much attention. To answer the question is to present the content of the course and also to suggest what should be offered if a successful course is to result. That is, if the subject is to be taught effectively.

I believe that the content of a satisfactory course should be as follows:

Lettering,
Geometrical Construction,
Orthographic Projection,
Developments and Intersections of Surfaces,
Machine Details (inking and tracing),
Assembly Drawings,
Isometric Drawing,
Freehand Perspective,
Elementary Machine Design.

All of these subjects doubtless look familiar to the drawing teacher of today but the mention of the subject itself does not by any means represent all that must be done to make a course effective. Shall we discuss each subject in some detail.

Lettering—The instructor should devote a considerable amount of time at the beginning to emphasizing the great importance of lettering. The student should be made to realize that a drawing amounts to little as far as appearance is concerned unless the letters and figures are neatly and properly formed. He should be taught to space letters correctly in words and words correctly in sentences or phrases. He must realize that all letters and figures if properly formed could be included in a parallelogram. He must understand that horizontal guide lines should be always used; that single strokes are to be employed; that one must always work slowly at first and then practice, practice, practice. Eventually the prospective draftsman will be able to letter.

Geometrical Constructions—I can't imagine how the young draftsman could expect to advance without having a working knowledge of the rules and methods of practical geometry. Here is a chance to do some good work with mechanical drawing students. All instruction on this subject should include in addition to telling the student how to actually draw the constructions—several lectures illustrating the use of geometrical rules, explanation of definitions and the solution of practical problems. Practical mathematics and mechanical drawing are so closely allied that it does not seem right that a student hoping to some day be an efficient draftsman should be denied the opportunity of receiving at least some real teaching on this all important subject of geometry. Models should be at hand in large number as aids to instruction.

Orthographic Projection—This is an exceedingly

important subject because practically all working drawings are made according to the rules of orthographic projection. The instructor should explain in detail the difference between first and third angle projection; he should illustrate by means of sketches how the various views ought to be arranged as regards their relation to each other; he should point out how their views are similar and how they differ. And the teacher should have as part of the equipment a projection case so that the student can tell at a glance how the various views should be drawn. Orthographic projection is indeed an important subject. It must not be neglected.

Developments and Intersections of Surfaces—An interesting subject and of value to those contemplating entrance to a field requiring a knowledge of sheet metal work. Also of great value to all students because of the mathematical training received and the insight obtained in the subject of solid geometry. Intersections should be made of all of the common solids such as the prisms, pyramids, cones, cylinders, etc., and the rules and definitions related to these should be discussed as the developments are being drawn. An excellent scheme in this work is to cut out the developments after they have been made and fold them as they should be to form the object. This not only serves to check the accuracy of the work but promotes an interest by showing the student what the actual object developed looks like. The relation between the object and its development is thus well established in mind. As soon as the fundamental principles have been learned they should be applied to the development of such objects as one might expect the tinsmith to develop — objects, for example, such as cans, pails, stove pipes, coal hods, etc. This may easily be developed from paper instead of the customary metal.

Machine Details—To the would-be machine draftsman this is an exceedingly important and interesting subject. The instructor should realize its importance and plan accordingly. Stress should be given the importance of neat and accurate work. The student should fully understand that a detail drawing not completely dimensioned is of no value to the man who has to work from it. He must be able to put himself in the place of the man in the shop in so far as possible and the instructor should assist by giving some lectures on machine tools, shop processes, etc.

The use of the various scales should be explained in connection with this subject, the various drafting room "kinks" related to inking, tracing and blueprinting should be discussed. If possible (and it should always be possible) simple details of actual machines should be at hand and these sketched and drawn. This would be done a little later in the course.

Assembly Drawings—An assembly drawing is really a representation of the details taken together to form the complete whole. The student should have the privilege of inspecting and studying several assembly drawings. It is an excellent idea for the instructor to have an assembly drawing made (a globe valve is a good object to choose) and available in blueprint form for distribution among the students.

This particular assembly drawing should have all of the dimensions on it. The student should be required to "pick the drawing to pieces" and make complete detail drawings of each part. He should then take his detail drawings and draw the assembly. This will not only permit a check on the accuracy of his detail work but he will, in addition learn how to make an assembly. This assembly drawing should contain only a few overall dimensions.

It is a good plan to require that this final drawing be drawn in ink rather than traced and that it be drawn as it ought to be drawn if it was to be reproduced in a catalog.

Isometric Drawing—All draftsmen should understand how to make a simple isometric drawing. It is frequently convenient for one to know how to represent an object in one view. Isometric drawing seems to be the best medium for accomplishing this result. The principles of the method should be carefully explained and several drawings then made. These drawings may be inked or not. The time available will govern the matter.

Freehand Perspective—Both the draftsman and the man in the shop are frequently called upon to make freehand sketches. The student should understand that a draftsman often is obliged to make a finished drawing from a sketch. It may be from his sketch or from a sketch made by another. In any case he should be able to draw from a sketch and also to make one. An illustration of this would be, for example, something like this: Suppose there was a large machine in a city distant from the main office of the company that had manufactured it. Suppose this machine broke down. The student may assume that he is the one selected to go from the main office to the city, make a sketch of the broken part, *properly dimensioned*, and return to the main office for the purpose of making a working drawing of the broken section. He should be able to see that in a case like this it is very important that the sketch be well made and fully dimensioned. Every draftsman should be able to sketch well and it seems to me that every course in mechanical drawing can hardly be considered complete unless instruction and practice in sketching is included.

Elementary Machine Design—There is no limit as to the ground that can be covered here. It is excellent practice for the student to make the calculations necessary for the design of such objects as crane hooks, cams, screws of various kinds, etc. This will require no very extensive mathematical knowledge, will give some experience in the handling of formulae and will promote an interest in carrying the investigation into more difficult fields. At least some of this work should be given.

The content of a mechanical drawing course as briefly outlined above, is as I have used it in the train-

ing of many hundreds of students. I have used it extensively in evening classes, in university extension work and it is, in substance, the course which will be generally adopted in the national educational program to be promoted by the International Committee of the Y. M. C. A.

The course if arranged as suggested will certainly produce results. These results will be such as to assure an opinion from those who may be called upon to judge that here is a satisfactory illustration of mechanical drawing taught effectively.

FELT: A Fascinating Fabric for Expressing Design

Bonnie E. Snow and Hugo B. Froehlich.

Article One.

WHERE can we get it? How much does it cost? Is it difficult to manipulate? Is it practical for primary grades? These are questions that will be asked by thousands of teachers who are eager in their quest for new ideas, but who are restricted by their school budgets to the use of materials which are both inexpensive and easily obtained. Felt is not a new fabric. We have worn it in slippers and in hats and caps. We have used it in mats and in coverings for tables and pianos. Cabinet makers have lined boxes and drawers for silver with it, and college students have waved pennants of felt at foot-ball games and at various "meets" and field days.

Felt is a fabric well known to the commercial world, but its use as a school material is not general, because its possibilities and its attractiveness are not realized.

The first use of felt as an industrial art medium occurred, naturally enough, in a town where felt mills were in operation. Children from the homes of the mill hands brought scraps or waste of felt to school. A bright teacher experimented with this material. She found that it could be cut into decorative shapes almost as easily as paper. The cut edges required no trimming or hemming to keep them from raveling. (Felt is not woven or spun, but is made of a mass of wool or cotton fibres pressed and rolled into a fabric of uniform thickness). It was an easy step from the cutting of decorative shapes from paper to the cutting of similar shapes from felt. Needlebooks, pen wipers, small bags and hat ornaments soon developed. The teacher made a visit to the felt mill, and as she was the first outside person who had ever evinced interest in the output of the mill, she was presented with a large bundle of scraps. With teacher-like generosity, she shared her good fortune with a fellow worker; but alas! upon the occasion of a second visit to the mill, she found that a price per pound had been put upon the scraps. This price followed the custom of commerce, and increased in proportion to the demand.

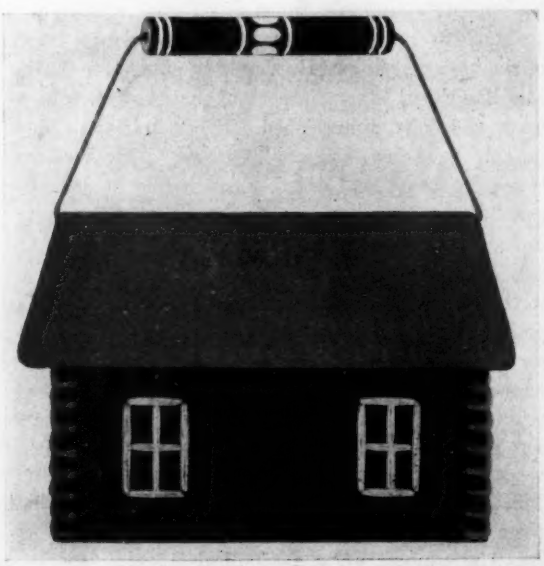


Fig. 1. Child's Bag.

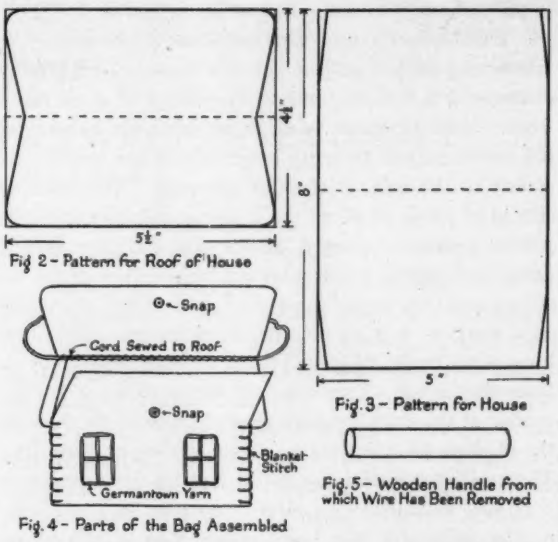


Fig. 2 - Pattern for Roof of House

Fig. 3 - Pattern for House

Fig. 4 - Parts of the Bag Assembled

Fig. 5 - Wooden Handle from which Wire Has Been Removed

Nothing daunted, the teacher and her associates sent out an appeal to the school patrons for old felt of any quality, color or state of preservation. The result was a quantity of old slippers, children's caps and hats, hat trimmings, and, best of all, a number of old college pennants, gorgeous in hue. Sometimes a bath in gasoline was necessary to make this material fit for use. A worn piano cover of a fine green color was one of the contributions. Various substitutes for felt were also discovered, such as broadcloth samples from the establishments of ladies' tailors and dressmakers. An old black broadcloth coat was hailed with delight. It furnished the finest kind of backgrounds

for bags, needlebooks and scissors cases, decorated with shapes cut from bright felt and embellished with wool embroidery.

City friends of the teacher visited factories where felt articles were made. They purchased, by the pound, short lengths, remnants, imperfect sections, trimmings and scraps. Then the school supply houses got busy. Hearing of this new material which the teachers were finding for themselves, they bought felt by the yard in desirable colors, cut it into pieces and sold it in packets of assorted colors. So that now felt may be obtained in proper sizes and colors for schools, and at moderate prices.

A charming little bag for which a child will find many uses is illustrated in Fig. 1. Its chief attraction will be its color. Orange and yellow-green; yellow and violet; bright red and gray; with stitches of black or white, used in each, are three of the many combination which may be employed. In all instances the cord and the handle are made to harmonize with the selected colors of felt.

Fig. 2 gives the dimensions and the pattern for the "roof" which forms the top part of the bag. It is generally the brighter of the two colors used. The pattern should first be cut from paper and the felt shape cut from it. Fig. 3 gives the dimensions and shape for the "house" which forms the bag. This, too, should first be cut from paper, as felt is too precious to waste thru possible misfits. Before the straight edges at the sides of the bag were blanket-stitched together, the windows were sewed on one side. Six long stitches of germantown yarn were used for each little window. Then the straight edges of the bag were blanket-stitched together. The handle was a common wooden parcel carrier, with the wire removed. A coat of black opaque water color was first applied and allowed to dry. Then the decorative bands were painted in white and one color. (Generally, this one color matches the color of the roof.) When this paint was dry the handle was given a coat of shellac or varnish.

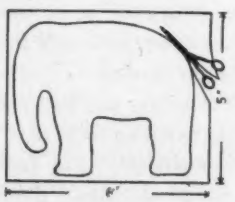


Fig. 7.

Fig. 8.

Fig. 10.

Fig. 9.

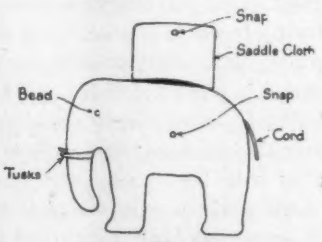


Fig. 11.

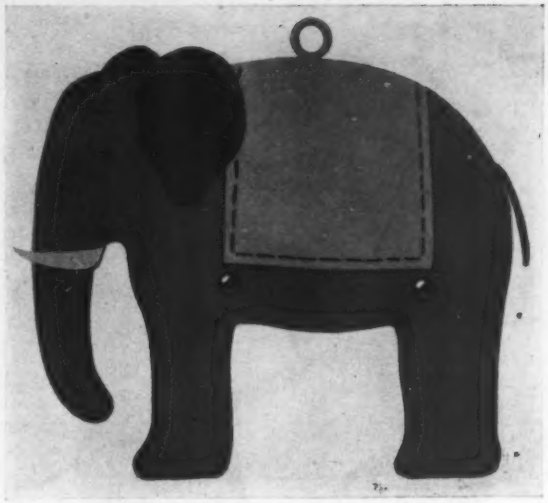


Fig. 6. Elephant Button or Marble Bag.

The cord was twisted or knotted in the well known "idiot's delight" method. It may be made of yarn or cotton, but in color it must play its part in the general scheme. About fifteen inches of cord will be necessary. Baste the back upper edge of the house to the middle of the roof. Lay the middle section of the cord along the basting and sew it firmly in place with small stitches of thread. Slip one end of the cord thru the hole in the handle, and knot the two ends of the cord together. Slip the handle over the knot. Remove the basting thread, and sew a snap fastening on the under side of the front of the roof, and on the outer side of the front of the house, as shown in Fig. 4. These little bags were filled with small wooden Noah's Ark animals, and used as Christmas gifts. Hence the name—A Noah's Ark Bag.

Another bag which was a source of great delight to the children was the elephant button or marble bag, shown in Fig. 6. Gray felt was selected for this, with a blanket or saddle cloth of gorgeous orange. Fig. 7 shows the drawing of the shape which forms the pattern for the bag. Two separate pieces must be cut like this. Fig. 8. Fig. 9 shows the two pieces machine-stitched together, with a three-inch opening left across the top. Shapes for the ears and tusks are shown in Fig. 10. Use a darker gray felt for the ears (or, the same tone used for the body will do very well) and white or ivory felt for the tusks. The saddle cloth is a rectangular piece of felt, measuring two and a half by five inches, decorated with a running stitch of black. This saddle cloth is sewed to the back of the elephant, leaving the front edge of the opening free. A snap fastener is sewed to the saddle and the front side of the bag as shown in Fig. 11. A piece of gray soutache braid, a narrow strip of felt or a bit of cord will suggest a tail, while small bright beads, orange in color, used for the eyes will give the well known expression of sagacity to our elephant. Small brass bells (which may be bought at the ten cent store) are attached to each

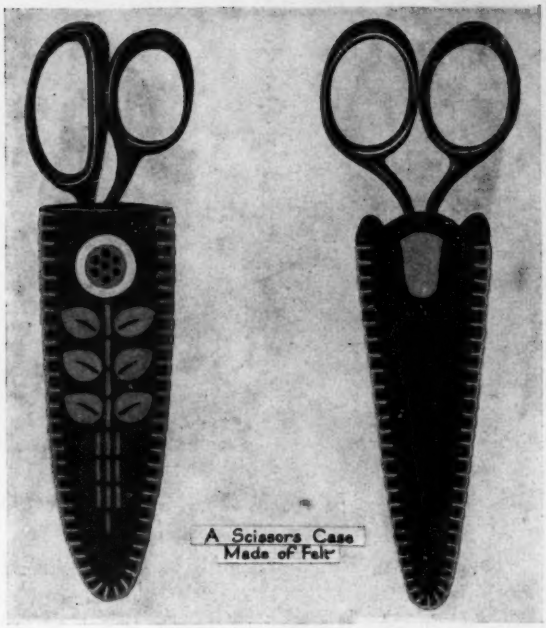


Fig. 12. Scissors Cases.

corner of the saddle cloth. A bone ring sewed to the middle of the saddle cloth makes a convenient hanger.

Another novelty which is of practical use is the scissors case shown in Fig. 12. The construction is very simple. A paper pattern should be cut which will fit scissors of a definite size. Fig. 13 shows the process. Paper shapes should be cut and arranged to form a design as shown in Fig. 14. Before beginning to cut the felt, it is best to express the whole idea of the scissors case in colored papers. Thus, a fine lesson in color and design will precede the actual making of the case. The design shapes of felt may first be pasted in place on the background, and then secured with stitches of yarn. The edges of the case are blanket stitched together.

The beauty of these little articles depends upon the care with which the colors are selected. When a definite color theory is taught by means of charts, these articles become expressions of the children's understanding of the laws of color harmony.

The "Pin Tree" (see Fig. 15) grew and flourished in a certain class of normal students, and doubtless has since been planted in a hundred towns. The smallest flower pot known to commerce was used as a basis. Its top and vertical height measured two inches. It was filled with wet plaster of paris, and a round stick or dowel was set in the plaster. (In the absence of suitable sticks a section of lead pencil, four or five inches long, answers the purpose. See Figs. 16, 17, 18.) When the plaster had hardened, the flower pot and stick were painted with opaque water color in a tone selected with reference to the felt that was to be used for the tree. Here again, complimentary, analogous, or split-complementary color schemes were consciously applied, with balancing notes of black and white. When the undercoat was dry, borders were added. The plaster of paris was usually left white. When all paint was dry, a coat of shellac or varnish was applied, and the flower pot with its stick was set aside to dry.

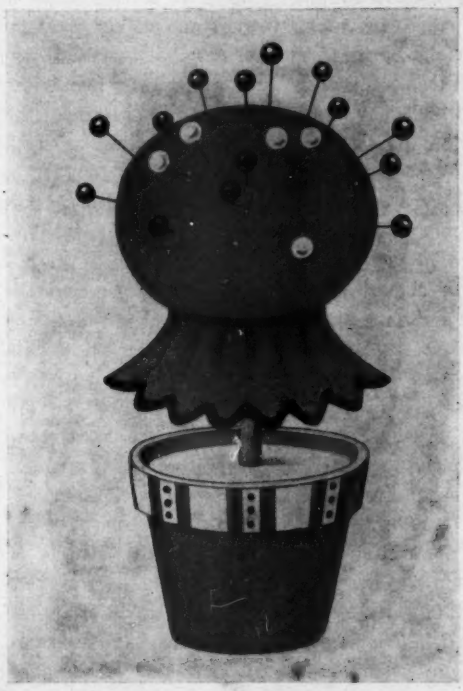


Fig. 15. The Pin Tree.

The next day, a wad or ball of cotton was tied (or glued) around the top of the stick, as shown in Fig. 19. A circle of felt about five inches in diameter was then prepared and decorated with a design similar to those shown in Fig. 20. Generally, the circle of felt was green, and the design remotely suggested flowers or fruit. It was expressed in flat shapes of orange, yellow, white, blue, black, etc. These small shapes were first pasted in place and then secured with a stitch or French knot of yarn. The circle thus decorated was placed over the cotton and tied with yarn securely to the stick. Pins with bead heads were stuck in the tree. Some of the students went so far as to paint these pin heads in tones that formed a part of the whole color scheme.

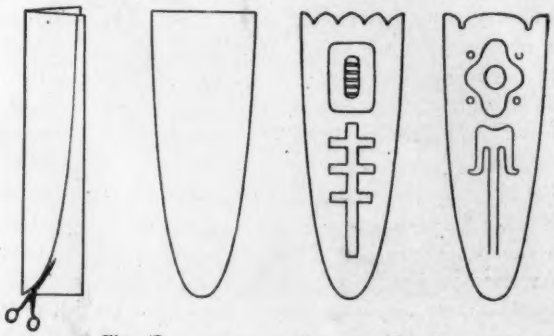


Fig. 13. Fig. 14.

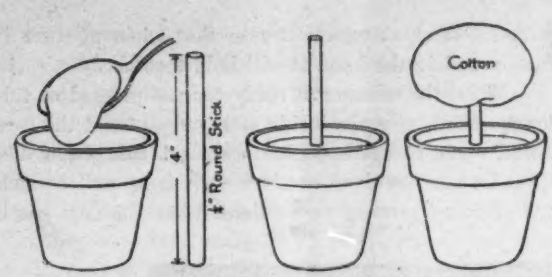


Fig. 16. Fig. 17. Fig. 18. Fig. 19.

The best result of this lesson was the invention which developed. In a class of seventy no two trees were alike. Tho all the students started with the same materials and with the same type of tree, opportunities for individuality were found in painting the flower pots, in the decorative designs for the tree, and, most delightful of all, in the daring color schemes, quite legitimate in this small article of use and beauty.

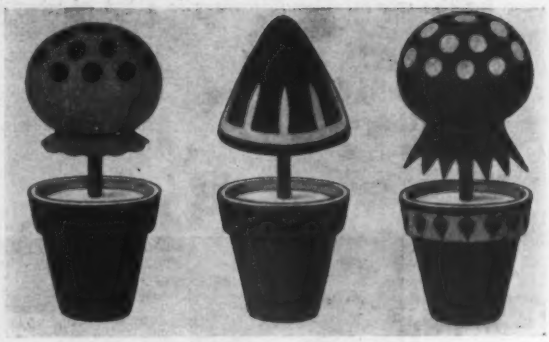


Fig. 20. Designs for Pin Trees.

POSSIBILITIES OF CEMENT IN MANUAL TRAINING

Frederick A. Adams, Clark School for the Deaf, Northampton, Mass., and
Chester E. Chase, Practical Arts Department, Springfield, Mass.

IN these days, the tendency is to use other materials in conjunction with wood or in place of it in many manual training classes. When selecting these materials, there are several points to be considered. The materials must be fairly inexpensive and be such that the students of the upper grammar grades and the high school can work with them to advantage. The finished product should be worthy of the time spent in its construction.

One such material, which is proving very successful, is cement. For some time it has been used in schools where construction problems have been worked out. Such projects as bridges, dams, model side walks, etc., while very practical are useless when complete. Often these projects would not hold the pupil's interest for any length of time; neither do they present a broad enough scope for design. The following outline therefore, is presented not to displace the sort of work just referred to, but rather to supplement it.

The equipment necessary for the work is quite simple, and nearly everything needed is found in the average shop. It is not even necessary to have a decided gap between this and the regular woodworking course. In fact, the pupils get more when the two courses are correlated.

The first project might be a flower box, the size and design optional. The mould should be made in the woodworking classes. As the moulds must have draft, here is an opportunity for presenting the elementary principles of pattern making. In some cases, after a good design has been worked out, it might be possible to have the mould cast in metal. In general the procedure is as follows:

First,—Design.—This may be worked out in the art department. Full size cardboard constructions, painted to show panels and other features of design are very helpful.

Second,—Working sketch of mould.—This should be taken from the cardboard model. If desirable a drafted sheet might be made also at this time.

Third,—A.—Material.—Any soft, close grained woods such as pine, white wood, bass, etc., is very good.

B.—Construction—First, square up stock for the four sides. Second, make panels, lips and cleats for sides. Third, get out stock for core and base. In making the core two methods may be used, either building it up of solid pieces or making it hollow. See Fig. 1. The base must be large enough to contain the centering pieces as shown in the sketch.

C.—Assembly.—First, lay out the position of the panels and lips on the sides and fasten them in place using glue and brads. If these are correctly made no fillets will be necessary, but if required, bees wax may be used. In all events, care must be taken to have sufficient draft on the panels, lips and core that they may be drawn without damaging the project.

Second, fasten cleats to ends and sides and locate carefully and fasten in place the centering pieces on the base. Third, lay out and bore holes in end cleats to receive the rods which hold the mould together. One-eighth inch iron rods threaded at both ends are used. Nuts for these may be purchased ready made if desired.

D.—Finish—The life of the mould depends on the finish. One method of finishing which has proved satisfactory is to sandpaper the parts well, apply a coat of deck paint, allow sufficient time to dry thoroly, sandpaper again lightly to remove roughness, apply second coat of deck paint and allow to dry hard. Another method is to use shellac and spar varnish.

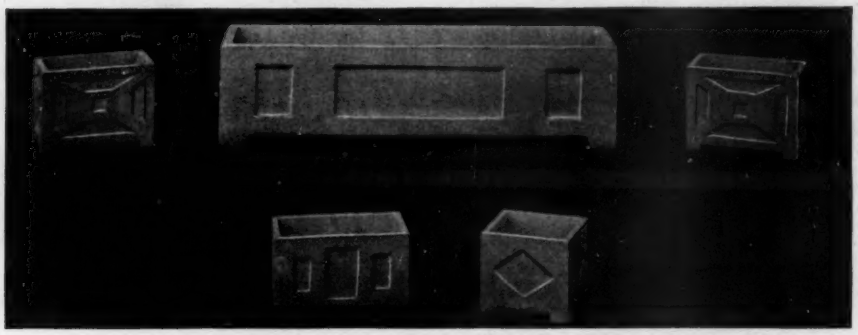
If desired, while the mould is drying, the pupils may be making the tools and other equipment neces-

sary for the work. The following is a list of what is needed. (See Fig. 3).

1—mixing box or board.
1—small shovel.
1—small hoe.
1—scoop.
2—tamps, wooden or metal, to fit mould.

parts of sand, enough water so that when mixture is compressed in the hand it will hold together.

When the mixture is ready for use proceed as follows: First, give the inside of the mould and the core an oil wash, using linseed oil. Second, into the mould spread a mixture about one inch deep, tamp well, scratch the surface to insure a good joint when the next batch



TYPICAL FLOWER BOXES MADE BY THE AUTHOR'S STUDENTS.

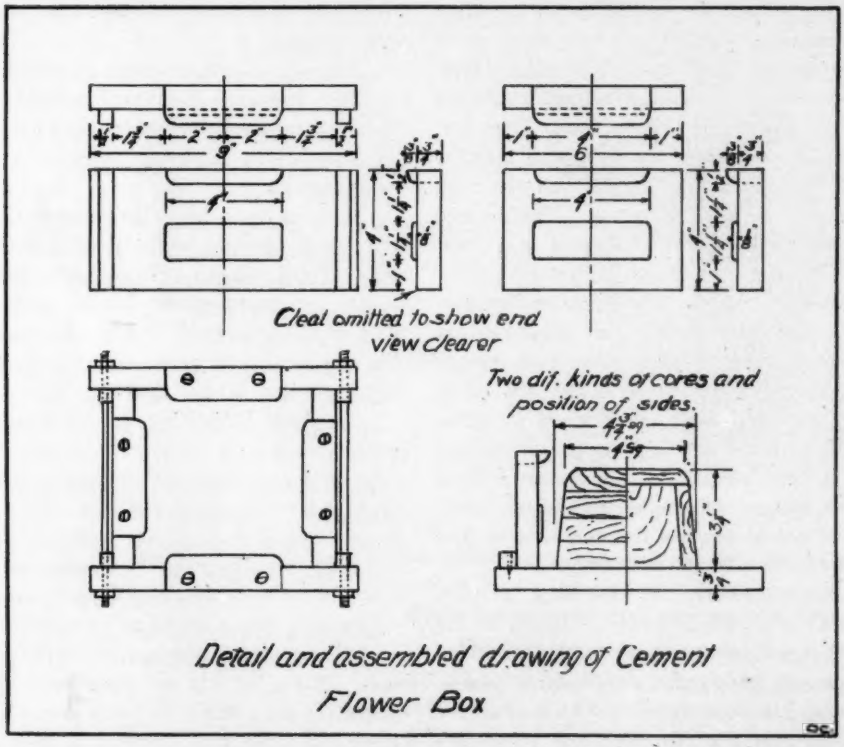

Cleat omitted to show end view clearer
Two dif. kinds of cores and position of sides.
Detail and assembled drawing of Cement Flower Box

Fig. 1. Detail of Flower Box.

1—mallet.
1—straight edge, beveled on one side.
2.—moulding tools, heart and square. It may be necessary to purchase these.

Fourth,—Mixing cement and making flower box.—At this time, if desirable, time may be taken to do some experimental work in testing the strength of materials, etc. However the following proportions have been found satisfactory: One part of cement to two

is added. Add more mixture, tamp and scratch as before and continue until the mould is full. Care must be taken to have the corners and under the lips well tamped. The mallet is used to do the final tamping. When the mixture has been tamped so that the imprint of a finger will not show, level off the top, using a straight edge. Smooth this surface with a moulding tool. Third, place a flat board on the exposed surface and carefully invert the mould. Rap the mould lightly

all around and draw the core. If necessary, smooth the inside with the moulding tools. If the mould is not a very large one the sides may next be removed but this is a rather difficult operation for a beginner and it would be better at first to allow the sides to remain in place until the mixture has set when they may easily be removed. The core and sides should be wiped off dry after they have been removed. Fourth, the cement box should not, at this time, be removed from the board upon which it rests as it is not tempered. To temper, moisten thoroly once daily for a week. Do not place it

material at hand, such as old gas pipe or the like, may be used.

The construction of round objects such as bird baths, sun dials, urns, etc., requires a different method from that used in the preceding work. These objects are developed by means of a sweep and template. The mixtures and methods of reenforcement are the same as those previously described.

The first thing needed is a bench or substantial table about thirty inches square and thirty inches high with a smooth, level top. The top is greatly improved

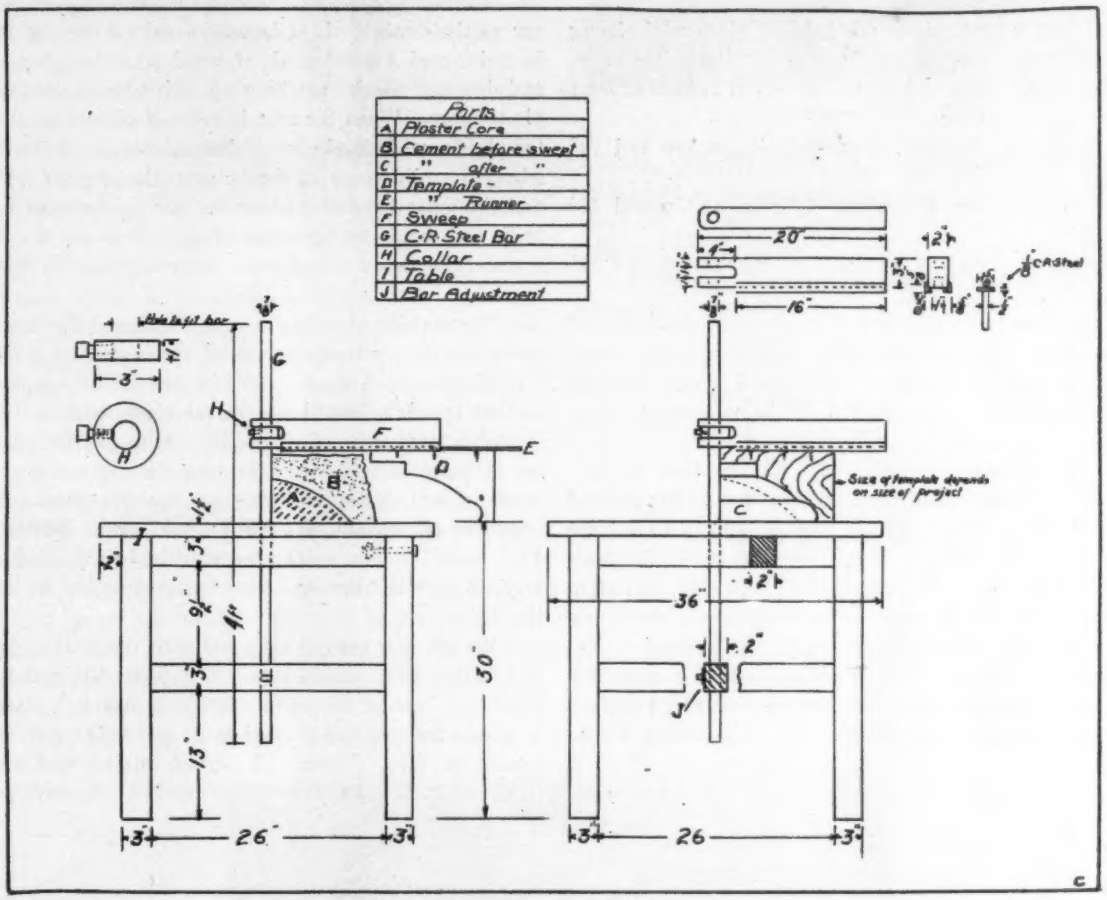


Fig. 2. Bench for Making Circular Projects.

in the sunlight as cement will crack when dried out too quickly.

There is practically no limit to the sizes and designs possible in this work. The accompaning photographs show a few successful projects worked out in the authors' classes.

The more advanced work under this type includes such things as garden tables, benches, etc. The moulds are constructed in practically the same manner and the mixtures are the same, the only difference being that strength of materials and reenforcement must be taken into consideration. One-quarter inch round iron makes good material for reenforcing this work. However any

if it is covered with sheet metal. Thru the center of this table should run a rod about three-quarter inch in diameter extending about thirty inches above the top and fifteen inches below it. This should be adjustable as to height and held securely in place by means of a set screw and collar located under the table top. (See Fig. 2). It is well to have a number of portable tops for the table, the reason for which will appear more clearly later on.

The next thing to consider is the sweep which is most clearly described by the drawing, Fig. 2. Any hard wood is suitable for this and the metal parts are easily made by the pupils.

GARDEN SEAT AND BIRD BATH.

The cement mixture is held in place while being tamped by a sheet metal form which is similar to an inverted pail with no bottom. It is well to have at least three of these forms.

I—about 26″ dia. at bottom—24″ dia. at top and 10″ high.

I—about 18″ dia. at bottom—15″ dia. at top and 18″ high.

I—about 12″ dia. at bottom— 9″ dia. at top and 24″ high.

These sizes will take care of most work done, but of course as different objects are developed more forms can be made as desired. The forms should be well made with lock joints. It will also be necessary to make some larger tamps for this work.

In constructing a bird bath, for instance, the following outline is used. The design is carefully worked out full size. When this has been completed a template is made from one-half of it, (see Fig. 20). The template is usually made from one-half inch stock and after the contour has been cut a metal duplicate about one and one-half inches wide is made and fastened to the wooden template so that it projects about one-quarter inch. The object of this is to insure a smoother surface on the cement. When the object is to be hollow, a core is necessary. This may be of wood and turned on a lathe or of plaster-of-paris and swept in the same manner as the cement. It is better to make a core, which is to be used a great deal, of wood as it lasts longer and does not require patching up each time as does the plaster core. When the core is to be of plaster another template must be made, but it does not require the metal edge. The difference in size between the core template and the outer template determines the thickness of the walls and should be figured carefully. It would also be necessary to have a template when turning the core from wood.

The making of a plaster core is rather difficult and needs the constant supervision of the instructor. The procedure is as follows: Adjust sweep and template so that template just clears the table top easily. Give the table top a wash of linseed oil. Mix sufficient plaster of paris to make the core and start by putting a small amount on the table and sweeping the shape, adding more as required until the finished size is obtained. This must be done quickly as plaster-of-paris hardens very soon. When the core is hard sandpaper and shellac it.

We are now ready to proceed with the bowl of the bird bath. First oil the core, the exposed bar and the table top. Select the form nearest in size and center it around the core and proceed to cover the core with the cement mixture. Tamp well, scratch surface and continue until the required height is reached. Remove the

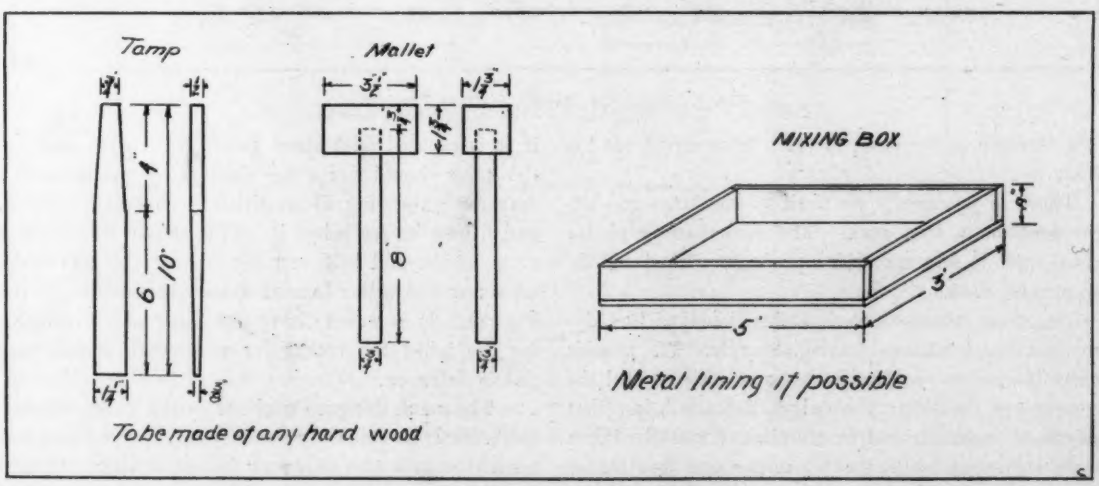


Fig. 3. Homemade Aids for Concrete Work.

form and adjust the sweep and template so that the template clears table top easily. Now begin to sweep starting at the extreme outer edge and knocking the template gradually toward the center with each revolution. Do not attempt to force the template toward the center too rapidly as this may crack the work and make it necessary to start over. There will be considerable mixture swept away which may be utilized at once to make flower pots, etc., thereby reducing waste and cost.

The tempering process is the same as that described in the previous work. If, as suggested, a number of portable tops are at hand, the one containing the work just finished may be removed and another placed in position and the work continued. This eliminates the necessity of having more than one table, or of waiting until one object is tempered before starting another. It would of course be necessary to have more than one core if the same kind of objects were to be made in this way. The base of the bird bath is made the same as the bowl except that it is solid and requires no core.

There are several commercial preparations which may be used to make the objects waterproof, but a method which is successful is to make a mixture of nearly clear cement using a little very fine sand. This is brushed on to the inside of the bowl. It is best to moisten the surface, however, before doing this.

It is possible to work out a course of this sort which will include all the educational points gained in the ordinary cement construction. In addition, it will offer a very good opportunity for design, mechanical drawing, pattern making, and moulding—the two latter perhaps to a limited extent.

The boys develop considerable satisfaction in being able to create something which is to be permanent and useful. Taken from the financial standpoint, the product is such that if desirable a market for it may be easily obtained.

GARDEN SEAT.

The following table of mixtures may be helpful in obtaining different colors. If it is impossible to obtain the Ipswich sand any clean, sharp, gray sand such as is found on beaches or river banks will do. Allowance must be made however if the sand is any other color as is frequently the case. A little experimenting will determine the proportions.

1—Regular mixture, dark gray.
1 part cement (gray).
2 parts Ipswich sand.

2—Medium Gray.
½ part gray cement.
½ part white cement.
2 parts Ipswich sand.

3—Light Gray.
¼ part gray cement.
¾ part white cement.
2 parts Ipswich sand.

4—White, Fine.
1 part white cement.
1 part marble dust.
1 part quartz sand.

5—White, Coarse.
1 part white cement.
2 parts quartz sand.

Dry colors may be added to any of these mixtures and practically any effect can be produced.

NOW IS THE TIME FOR BIRDHOUSE CONSTRUCTION AND BIRDHOUSE CONTESTS.
The picture shows the products of a class in School No. 24, Wilmington, Delaware. Miss A. Mary Cornell, Teacher.

FIRST AID TO THE INEXPERIENCED—VII

SELECTION OF EQUIPMENT, CONTINUED

S. J. Vaughn

IN the February magazine, an attempt was made to set forth some principles upon which the selection of equipments might be made and to prepare some specific lists in harmony with those statements or principles. The method of selecting a typical equipment for a grade woodworking shop for a definite purpose was carried forward from an ideal equipment to some of the possible modifications necessary to meet specific local conditions. The previous article closed with a suggested $400 list in the selection of which an effort was made to do as little violence as possible to the principles laid down.

But after the ideal equipment, the $800 equipment, and the $400 equipment have all been planned, a great field is left entirely untouched, for vast numbers of communities will start manual training, if at all, on a much smaller amount than even the smallest of those mentioned. Many of the small towns and rural communities are asking what can be done in the way of starting manual training with small sums of money ranging from $200 down to $50 and even less.

No serious attempt should ever be discouraged. It is no uncommon thing for a teacher in a small village or rural school to state that a small amount of money has been realized from some school or community effort, and to ask if a beginning could be made toward a manual training equipment with the funds on hand. My reply is always in the affirmative without regard to the amount mentioned. I try to tell such an enquirer what to buy, what to borrow, what part can be made, and what to plan for future developments.

Many a start has been made with $25 or less. A few dollars plus some leadership, some enthusiasm, some community spirit, and an abundance of energy are an excellent recipe for the beginnings of a successful manual training shop in a small community.

It is proposed here to submit two lists, one for $200 and the other for $75, as typical of what might be done with these sums in providing shopwork for communities that cannot supply the larger and more expensive facilities. When we consider the purposes which the teacher would desire to meet, the values which he would hope to assure to every boy, the ambition to place his own work on at least a creditable basis in the community, and the wholesome wish to establish and maintain such work as he himself could respect, it will be easily understood what an undertaking it is to try to meet all these ideals with so small an amount of money.

As the amount to be spent decreases, the individual tools in the list become fewer. With the very limited equipments, all the tools become in a measure general tools, and it becomes a question not so much of how many or what tools are desired, but of how the work can be organized so that the few tools that can be bought may be used to the best advantage.

A $200 Equipment.

Now, let us assume the following local conditions and undertake to meet them with the amount specified:

I. Floor space 20 feet square.
II. Three classes a day of eighth grade boys.
III. Amount to be invested, $200.

6 double skeleton benches with rapid acting vises.
6 smoothing planes, 8 inch.
6 two-foot rulers, $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$.
12 trysquares, 8 inch.
4 cross cut saws, 22 inch, 8 point.
4 rip saws, 22 inch, 7 point.
4 hammers.
4 marking gauges.
4 chisels, socket, $\frac{3}{8}$ inch.
2 chisels, socket, $\frac{3}{4}$ inch.
4 cabinet clamps, 5 ft.
4 cabinet clamps, 3 ft.
4 screw drivers, 8 inch.
4 ea No. 4, 5, 6, 7 wood drill bits.
4 cabinet scrapers.
3 braces, 5 inch swing.
3 oil stones, 1"x2"x6".
3 mallets.
2 jack planes, 14 inch.
2 back saws, 12 inch.
2 ea $\frac{1}{4}$", $\frac{7}{16}$", $\frac{3}{4}$" auger bits.
2 wing dividers, 6 inch.
2 counter sinks, rose.
2 nail sets, cup point.
2 wood files, 10 inch.
2 bit gauges.

$75.00 Equipment.

When it comes to planning a $75 equipment, it ceases to be a question of large, determining factors, floor space, number of pupils, or other consideration. It is a question of how many usable woodworking tools can be bought for the money, and how to select them so that the largest number of pupils may have access to some sort of woodworking. Perhaps the first necessity is to provide some device or bench upon which the work may be done. If this is to be included in the equipment to be purchased, it will be the first item. If a saw, a hammer, a plane, and a square be added, the essential woodworking tools for the doing of a large number of fundamental operations will have been provided. After the question of necessity has been met, then come the accessory tools and conveniences. The following is a judicious attempt to spend $75 as wisely as possible in the purchase of a small equipment for manual training:

2 double skeleton benches, rapid acting vises.
2 smoothing planes, 8 inch.
2 hammers.
2 cabinet clamps, 5 feet.
4 try squares, 8 inch.
2 cabinet clamps, 3 feet.
1 jack plane, 14 inch.
2 marking gauge.
1 brace, 5 inch swing.
1 cross cut saw, 22 inch, 8 point.
1 rip saw, 22 inch, 7 point.
1 back saw, 12 inch.
1 ea $\frac{1}{4}$, $\frac{7}{16}$, 1 inch socket chisels.
1 ea $\frac{1}{4}$, $\frac{7}{16}$, 1 inch auger bits.

1 oil stone, 1x2x6 inches.
1 oil can, ½ pint.
1 wood file, 10 inch.
1 counter sink, rose.
1 nail set, cup point.
1 wing divider, 6 inch.

These two suggested lists assume the necessity for including benches in the equipment. In cases where the teachers are willing to make the construction of simple carpenters' benches a part of the work of the classes, a very large part of the cost of the benches, which is by far the largest item, may be saved to apply on the purchase of additional tools. Simple but serviceable benches may be constructed from 2″x4″'s and 2″x12″'s, or on the plan of the regular carpenter's bench by the use of 2″x4″ framing with one inch stock for top and sides.

An All-Purpose Grade Shop.

Since the need is so great in the elementary school for contact with a great variety of materials, processes, and experiences, perhaps the ideal arrangement would be found in the all-purpose shop. Woodwork alone does not appeal with equal force to all boys and does not furnish a sufficient richness and variety of experiences.

Such an all-purpose shop should furnish access at least to facilities for woodworking, electrical work, sheet metal, simple forge work, elements of foundry practice, simple pipe fitting and other elementary processes of the plumber's work, and perhaps other lines.

These various partial equipments should be in close relation. Indeed they could all be accommodated in one moderate sized shop by placing the woodworking benches in the central part of the room and a narrow bench entirely around the shop against the wall for the partial equipments for the various suggested lines of work. A definite section of the wall bench would, of course, be set aside for a particular kind of work. In case the size of the room permitted, small booths could be constructed around the wall in which the various lines of work mentioned could be carried on simultaneously.

This idea is certainly in harmony with the modern movement in elementary education. If put into operation, it would materially modify the woodworking that is now being given, and hence would make advisable some marked changes in woodworking equipments. From my point of view, such a shop is infinitely more desirable for the elementary school than an elaborately equipped woodworking shop.

Printing Equipments.

While the general principles of equipment selection hold good in printing as well as in woodworking, there are certain points of difference to be taken into account. Besides the essential technical differences, there are also substantial differences in matters of use, quantity, accessibility, etc., between a printing equipment and a woodworking equipment such as have been described.

In the first place, the work in a printshop is largely cooperative with but occasional demands for individual projects. The essentially social character of the printshop was discussed in a previous article. Owing to this cooperative character of the work, there are comparatively few individual tools in a printshop. Since it is almost necessary to carry on the work of any printshop on a cooperative and productive basis, the problem of organization is all the more important and necessary.

The three main determining factors in equipment selection indicated in a previous article—the kind of work to be done, the purpose of the work, and the courses to be offered—form the starting point in selecting a printing equipment. In undertaking to plan an equipment for high school use, the guiding factors may be particularized as follows:

1. The kind of work to be done is such printing as is done in a modern job shop.

2. The printing to be given is for general educational, prevocational, and guidance purposes.

3. The course to be followed is an organized arrangement of such printing as is needed by the business and social life and the instructional activities of the school system, together with such personal jobs as appeal to the individuals of the classes.

If these three factors were the only limitations, a printshop in a modern high school should acquaint the students with the fundamental phases of the whole present-day industry of printing and publishing. In order to do this, however, an elaborate and expensive equipment would be required. This would result in an ideal equipment following the same general lines of selection as the ideal woodworking equipment for the elementary school, as outlined in the preceding article. Without going into great detail, it is sufficient here to indicate in a general way the main features of such an ideal printing equipment.

Such an equipment as would be called for under this heading would contain as a minimum the following large, fixed pieces of machinery, etc., for general use:

1 platen press, 8″x12″, motor drive.
4 chases, 8″12″.
1 platen press, 10″x15″, motor drive.
4 chases, 10″x15″.
1 universal press, 14″x22″, motor drive.
1 cylinder press, 28″x40″ bed, motor drive.
1 power paper cutter, 38 inch.
1 wire stitching machine, motor drive.
1 perforator, motor drive.
2 linotype machines.
2 monotype keyboards.
2 monotype casters.
2 imposing stones and frames complete, 40″x80″, with furniture and reglets.
2 Cabinet Grand type cabinets complete.
6 Wisconsin window cabinets.
1 galley cabinet.
1 stock cabinet.
1 ink and roller cabinet.
1 proof press, 20x38.
1 lead and slug cutter.

The character of the remainder of the equipment is indicated in the following:

Two thousand pounds job type with sufficient variety of faces to meet the demands of the modern shop. This is in addition to the type that may be supplied by the monotype casters.

Twenty-five pounds assorted brass rule.

This equipment will, of course, include adequate quantities and varieties of galleys, sticks, composing rule, tweezers, etc., etc., to supply all the needs of the individual student.

No attempt is made in this list to itemize definitely the complete equipment. The foregoing items are presented simply to indicate the farreaching possibilities of a printing equipment with adequate funds for this purpose.

Modified Ideal Equipment.

In almost every case, there are various reasons why an elaborate and expensive equipment is neither possible nor desirable. Among these reasons are lack of room, lack of money, lack of a sufficient number of students to justify such outlay, and the fact that such an equipment would be wholly out of keeping with the facilities provided for the various other departments.

Let us, therefore, assume a set of local conditions in addition to the three determining factors—kind of work, purpose of work, and courses—and undertake to select a printing equipment to meet all the conditions.

1. High school in a progressive city of 20,000 population.
2. Room 24 feet square.
3. High school paper, blanks, stationery, reports, etc., for board of education; programs, tickets, and placards for school purposes; and lesson material for the lower grades are the kinds of jobs to be done in the shop.
4. Three classes per day of twelve students each.
5. Maximum cost, $1,500.

The following is an attempt to plan a satisfactory equipment to meet the conditions indicated:

1 C. & P. press, 8″x12″, motor drive, 4 chases.
1 C. & P. press, 10″x15″, motor drive, 4 chases.
2 motors, ½ h. p.
1 paper cutter, 26 inch, lever.
1 imposing stone and frame, 28″x80″.
1 Economy imposing stone and frame, complete with furniture, etc.
1 Cabinet Grand type cabinet No. 22, full top equipment.
1 stock cabinet.
2 double news stands.
1 Chicago drying rack.
1 Ink and roller cabinet.
1 Boston stapler.
1 proof press, 9″x27″.
25 lbs. 6 point body type, straight letter.
50 lbs. 8 point body type, straight letter.
200 lbs. 10 point body type, straight letter.
10 lbs. extra caps 10 point body type.
25 lbs. 12 point body type straight letter.
25 lbs. 18 point body type straight letter.
2 fonts 8 point Italic to match body type above.
2 fonts 10 point Italic to match body type above.
2 fonts 8 point Gothic.
10 lbs. 12 point Engravers or similar face.
2 fonts 24 point Engravers or similar face.
2 fonts 24 point bold type for headings and display.
2 fonts 30 point bold type for headings and display.
2 fonts 36 point bold type for headings and display.
2 fonts 48 point bold type for headings and display.
5 lbs. 6 point spaces and quads.
15 lbs. 8 point spaces and quads.
20 lbs. 10 point assorted spaces and en quads.
25 lbs. 10 point assorted 1, 2, and 3 em quads.
10 lbs. 12 point spaces and quads.
5 lbs. 18 point spaces and quads.
1 font 24 point assorted spaces and quads.
1 font 30 point assorted spaces and quads.
1 font 36 point assorted spaces and quads.
1 font 48 point assorted spaces and quads.
2 lbs. assorted fractions, 10 point to match body type.
1 lb. assorted braces and dashes, 10 point to match body type.
5 lbs. hyphen leaders, 8 point.
100 lbs. 2 point L. S. leads.
100 lbs. 6 point L. S. slugs.
1 small font L. S. brass leads, 1 point.
1 alphabet of wood type, 10 line.
16 brass galleys, 6¼x15¾.
16 zinc galleys, 6¼x23¾.
8 zinc galleys, 8¾x13.
1 brass galley, 12x18.
16 Yankee job sticks, 2¼x8.
2 Yankee job sticks, 2¼x12.
2 lbs. assorted borders, 6 point.
2 lb. font brass rule, 1 point face on 2 point body, beveled on one side.
1 lb. font brass rule, hair line face on two point body, beveled one side.
1 lb. font 3 point brass rule.
1 small assortment of Vogue ornaments.
1 No. 2 Harris rule case.
1 piece perforating rule, 24 inches.
2 doz. Wickersham quoins.
4 Wickersham keys.
1 planer and mallet.
1 proof planer.
1 quart safety benzine can.
1 benzine brush.
2 sets of roller bearers for each press.
6 tweezers.
1 waste can.
2 doz. gauge pins.

A Less Expensive Equipment.

In undertaking to select from the foregoing list an equipment costing scarcely more than half as much, the same principles and method are used as were employed in modifying the woodworking equipments to meet specific conditions. Four things must be done, as follows:

1. Eliminate some of the large, general pieces of machinery, etc.
2. Substitute open stands for cabinets.
4. Eliminate some of the accessories and conveniences which are desirable but not absolutely essential.
5. Reduce the quantities of the various needed items.

Speaking somewhat loosely, there are two items of equipment that are absolutely essential in printing, the press and the type. All other items are relative and accessory in the nature of conveniences. The stone is simply a convenience in the locking up of type forms; the cases and cabinets are convenient devices for holding type, etc.; and the proof press, sticks, galleys, etc., are other conveniences to facilitate the getting of the type into the press. Hence, one might begin a list with a press and a quantity of type and then proceed by the principles of convenience and necessity to select additional items until the desired work may be possible with the equipment and the funds exhausted. The following is a satisfactory equipment for grade or high school purposes and would cost approximately $800 at present prices:

1 C. & P. press, 10″x15″.
1 motor, ½ h. p.
1 lever paper cutter, 26 inch.
1 stone and frame 26″x44″.

1 New Departure type cabinet, 50 cases and top equipment.
2 double news stands.
1 galley rack, 10 galleys.
10 lbs. 6 point body type, straight letter.
25 lbs. 8 point body type, straight letter.
100 lbs. 10 point body type, straight letter.
2 fonts 12 point body type, straight letter.
2 fonts 18 point body type, straight letter.
1 font 24 point bold type for headings and display.
1 font 36 point bold type for headings and display.
1 font 48 point bold type for headings and display.
1 font 8 point Italic to match body type.
1 font 10 point Italic to match body type.
1 font 6 point assorted spaces and quads.
5 lbs. 8 point assorted spaces and quads.
10 lbs. 10 point assorted spaces and en quads.
15 lbs. 10 point assorted 1, 2, 3 em quads.
1 font 12 point assorted spaces and quads.
1 font 18 point assorted spaces and quads.
1 font 24 point assorted spaces and quads.
1 font 36 point assorted spaces and quads.
1 font 48 point assorted spaces and quads.
1 alphabet wood type, 10 line.
25 lbs. 2 point labor saving leads.
25 lbs. 6 point labor saving slugs.
1 assortment wood furniture and case.
12 zinc galleys, 8¾x13.
4 brass galleys, 6¼x23¾.
12 Yankee job sticks, 2¼x8.
1 Yankee job stick. 2¼x12.
1 lb. font 2 point brass rule.
1 lb. font brass rule, hair line face on 2 point body, beveled on one side only.
2 feet hyphen perforating rule.
1 Harris rule case No. 1.
12 Wickersham quoins.
2 Wickersham keys.
1 planer and mallet.
1 proof planer.
1 quart safety benzine can.
1 benzine brush.
2 sets roller bearers.
4 tweezers.
24 gauge pins.

If it were necessary to reduce the list further in order to bring it within a smaller appropriation of money, the same processes of elimination, modification, and substitution would be applied until the list had reached the limitation specified. Probably the first modification would be the substitution of ordinary California job cases and a Bettis lead and slug case for the New Departure type cabinet; the second step would be reluctantly to eliminate the paper-cutter; the third step would probably be to reduce slightly some of the type quantities. Finally, in case of necessity, an 8″x12″ press would be substituted for the 10″x15″. These suggested changes would make approximately $200 difference in the cost of the equipment.

The attempt has been made in this and the preceding article to formulate at least some general plans of procedure in the selection of equipments. The difficult task has furthermore been undertaken of applying the principles proposed in the suggestion of typical lists of equipment in woodworking and printing to meet a given set of specific conditions. The same method of procedure might be illustrated as well in the selection of equipment for forging, machine shop, sheet metal, etc., but for the purposes of this series, it would seem to be unnecessary to carry it out to that extent.

SOME HAWAIIAN MANUAL TRAINING WORK

The photograph shows a small section of an exhibit recently held to show the work of the Kamehameha schools at Honolulu. The work was done under the direction of Miss Nevada Moore.

INDUSTRIAL-ARTS MAGAZINE

Board of Editors

E. J. LAKE S. J. VAUGHN

EDITORIAL

COOPERATION.

LOYALTY and unselfish industry are closely related in the welfare of the nation. How can our industrial teaching be so directed that unselfish service to society will be the purpose of every worker? The people of a community working together for common good must be strongly emphasized as an ideal in our schools if such a creed is to find expression in our industry. The individual must, of course, be developed for his own personal and ambitious interests; but the individual must never be allowed to lose his sense of obligation to the society of which he is a part. This is the great pedagogical problem of the time. "Service to society" may well become the watchword of our schools.

The cooperative project is not to be judged only by the technical training it gives. Every school organization is a cooperative project. The work involved may not be distributed equally but every one can be given some part in the project and there is no better way to promote community interest than by cooperative work.

Considerable more of the communal spirit which was aroused and developed by our forefathers at the "barn-raising" can be developed by our manual teachers. We can afford to overlook some disturbance of pedagogical routine in favor of arousing community interest.

LET'S CAN THE COAT HANGER.

THE coat hanger is still with us, we hear! In some considerable cities we understand that a coat hanger is a required "model" of each seventh or eighth grade boy.

To add dismay to surprise, the story comes that the coat hangers must be made exactly to specifications as to size and form. In one case reported, the length was to be 16 inches. The boy asked permission to make the article longer for his father's coat and was refused. At the next visit to the shop, the boy reported that he had measured his father's coat and that the hanger would have to be at least 20 inches long to serve the purposes for which it was being made. Whereupon, the teacher upbraided the boy for presuming to suggest a change in the teacher's plans. Which leads us to remark again that there are things going on in manual training now that pass the comprehension of man!

Will the time never come when some flexibility and life and the sense of meeting a real need under the limitations which it supplies may find a place in the manual training shops? Of course, these desirable changes are coming rapidly into the practices of the manual training teachers, but there are always counter influences that tend to stifle progress. Such influences take the form of stereotyped courses and directions that need only a phonographic record to complete the uselessness of the teacher; the other form of antiquated discussions of "sequential tool processes", and the third form of implicit reliance upon the discredited theory of discipline.

Let us repeat that skill in the elementary school is not a primary consideration, and even if it were, the influence just described could not produce it. Let us retain something of the reality and spontaneous enthusiasm for actually useful work, for the efficient meeting of genuine needs, and for participation in significant affairs that characterized us and our work during the war. Why drop back into the deadening routine of the coat hanger and the sleeve board?

OREGON HAS THE RIGHT IDEA.

A MOST hopeful word comes from the state of Oregon. The following is quoted from a recent report by the Oregon State Supervisor of Agriculture with reference to the manual training work in that state:

"In many of the rural high schools of Oregon, the orthodox necktie holder, taboret type of manual training has played out. Even in Portland, the manual training departments have vied with one another in the making of chicken coops, rabbit hutches, and hotbeds.

"When one of the instructors was complimented on their spirit of cooperation, he replied, 'We did not do this so much to aid the work in agriculture as we did to save ourselves. We have reached the place where we must have a real motive for our work. The students are interested in their gardens, chickens, and rabbits, so take an interest in making equipment for them in the school shops'."

This is what we call vitalizing and liberalizing manual training. Certainly the time has long past when the antiquated, formal, and useless "model" that is being imposed upon helpless boys in numerous parts of the country can be justified on any grounds. May the practice which was noted by the Oregon Supervisor and which may be found in all progressive states become the common practice wherever manual training is found. It is only by getting manual training to function in some real life relations that it can be most fully justified and that it can hope to meet the searching inquiries that are soon to be made concerning its value.

THE COURAGE OF CONVICTION.

WE attended a teachers' meeting recently and brought away an idea with regard to this exceptional year of school teaching that we believe worthy of emphasis. It was a large system of instruction that was represented by this meeting of teachers and a

system that was headed by one of those executives who not only invite but insist upon free discussion of school affairs. Every teacher present knew that this was a season of exceptional difficulty; teachers were never so much in demand as last Fall, and classes were never so crowded as during this year. This school director urged a free discussion of "our difficulties" by inviting those in charge of each particular kind of work to make a statement of their impressions as to results secured within the past half year. Several of the teachers, who prided themselves on the ability to carry things off under adverse conditions, reported that "instruction was going along as well as could be expected." Several others defined their work as "successful".

Then there arose in that meeting a modest but determined teacher who dared to disturb this benign self-satisfaction by a brief but significant statement. Said he: "I have been laboring under such crowded conditions and with such poor equipment this year that, in spite of my best efforts, the results are deplorable. I want every one who may be able to help our schools to know that the conditions of this year are disastrous, and that good work cannot be done. Otherwise, next year we will add one more chapter to the Farce of American Education in attempting the impossible.

"I move that the following statement be sent to each of our school executives: 'The teachers deplore the crowded classes and poor equipment of our schools which have seemed unavoidable this year, and wish to protest against a continuation of these conditions which make good instruction impossible'."

It is interesting to note that the motion was passed unanimously. Even the teachers who had stated that their work was successful, acquired the courage of their convictions by one candid confession.

MEETING THE HIGH COST OF MATERIALS.

THE manual training work in the schools is now facing one of its most difficult problems in the excessive cost of materials. The cost of lumber is mounting to almost prohibitive prices. Every attempt to introduce the work or to expand the work already under way meets this same complaint.

Now is a good time for teachers of shopwork to practice economy of materials as they have never practiced it before. The wastes that have been tolerated or excused heretofore should now be entirely eliminated.

Not only should every effort be made to buy economically and to be frugal in the use of materials, but never was there so good a time to make substitutions and to try new lines of work and new materials as now. Advantage could likewise be taken of this situation to emphasize the theoretical side of the instruction and to minimize the material-consuming phases of the work, until some relief may be in sight. Never was there so good a time, either, to study the relation of costs and overhead expenses, etc., to production and to impress the lessons to be derived from such study.

By taking such advantages of this difficult situation, the evil effects may be reduced to a minimum and the very crisis which faces us may yield abundant material for study and investigation.

IS IT ETHICAL?

SUPERINTENDENTS and school board members condemn teachers who break their contracts, and rightly so, for the teacher who does not hold sacred her word is lacking in principle and is to that extent undesirable as a guide for children. But, has it occurred to superintendents and school boards, that back of every contract-breaking teacher there is some school officer who is at least tacitly bidding for her services? Have not all school authorities met the superintendent, or principal, who has come visiting a school and who has abused the hospitality of his hosts by writing or telephoning, to some especially efficient teacher whom he has observed, an offer for a better position or better pay? Is it not a fact that in nine out of ten cases of contract-breaking, the active initiative has come from a professional head of a school system?

How can a bad practice like this be broken when the real culprits are the heads of school systems themselves? Would it not be better to stop finding fault with the teachers and criticize those who are at fault?

SURELY man has come to himself only when he has found the best that is in him and has satisfied his heart with the highest achievement he is fit for. It is only then that he knows of what he is capable and what his heart demands. And, assuredly, no thoughtful man ever came to the end of his life, and had time and a little space of calm from which to look back upon it, who did not know and acknowledge that it was what he had done unselfishly and for others, and nothing else, that satisfied him in the retrospect, and made him feel that he had played the man. That alone seems to him the real measure of himself, the real standard of his manhood.—*Woodrow Wilson.*

THE story of the ancient painter and shoemaker is very well known. The shoemaker set the painter right with regard to some mistakes he had made in the shoe of one of his figures; and which the painter, who had not made such accurate observations on shoes, and was content with a general resemblance, had never observed. But this was no impeachment to the taste of the painter; it only showed some want of knowledge in the art of making shoes.—*Edmund Burke.*

What needs to be done, can be done and must be done, and therefore we will do it and that is the end of it, so let us be cheerful about it.—*Chas. Parsons.*

We could have no artistic houses while there was one architect and each workman was less even than a machine—only part of a machine. There should be a mind to every pair of hands.—*William Morris (1883).*

LITTLE ARGUMENTS ON GREAT PRINCIPLES

On Finish and Art

Mr. Try Square seemed even more serious than usual as he sat at his desk. Frills, entering a trifle late, noticed that something had gone wrong with his colleague and spoke up breezily:

"Why so downcast this fine morning, Mr. Try Square? Which is it—output of insight or insight on output that makes you so demure? A man of your *keen vision* should meet all conditions with a smile, and *see* a way out of every difficulty."

"Well," replied Try Square grimly, "It's a matter ~~of *eye sight* rather than insight~~ with me. I always had prided myself on seeing a little bit better than the other fellow until this morning, when I visited my friend Jones, the Oculist. He insisted that I read a chart of unreadable letters, and then told me cheerfully that I must wear glasses for the rest of my life. Now who ever heard of a good manual training teacher wearing specs? Imagine me looking over a boy's shoulder to detect a fraction of error in his work *after having lost faith in my eyesight!* Imagine me, a manual training teacher, putting on a pair of horrible tortoise-shell goggles, so that I can see *just as well* as the boys in my class can see without them. *Can you beat it?*"

"Beat it?" echoed Frills cheerfully. "I think a pair of tortoise-shell glasses with a gold chain, will add much to your appearance, Mr. Try Square. I can even imagine that the school board will be impressed by the mature and dignified effect they will give you—why, the board might even raise your salary on the strength of it!"

"Me look well in glasses!" exclaimed Try Square in disgust. "It isn't a question of looking well: it is a question of seeing well! How can a manual training teacher see a perfect joint or the perfect finish of a piece of woodwork, with glasses on his nose?"

"I should answer that question with another," replied Frills. *"Why should he want to see a perfect joint or finish?"* I find my students giving far too much attention to finish, and far too little attention to general effect. They cannot see the forest for the trees, or the town for the houses. They put on the finish first. I sometimes think your manual training department should be called the finishing school. You know that old idea of the finishing school has gone out of education, and now we are just having one commencement after another. Did you ever hear this ditty:

'Finish and Death, born of despair,
Travel together everywhere.
Each of the other the counterpart,
They travel together, *yet never start,*
For each is the end of life and art!'"

"No," confessed Try Square, "I have never heard just that version; but I have heard the same sentiment expressed in fewer words:

"'Life is just one ———ed thing after another.' And I suppose that art is in the same class!"

START TEACHING ACCOUNTS

Janet G. Cation, Extension Clothing Specialist, Iowa State College, Ames, Ia.

RE you teaching the clothing budget?" is a question I have asked 235 home economics teachers during the past year.

The answers I usually receive are: "Well, I haven't done anything along that line yet, but if we finish our sewing in time, I may spend a day on the subject at the end of the year," or "You see, this is just a one-year course, so we can't get in any of those extras."

The fact that the course is a one-year course makes it all the more necessary for the teacher to introduce the subject of budgets.

I talked to a young man a few years ago who was hopelessly in debt. He was married a few weeks after finishing high school. Neither during his entire school course nor in his home had he ever heard anything about the division of income. Was it any wonder that the first week he spent two dollars more than he earned, and that he has gone behind ever since?

Every pupil in the eighth grade and high school should have some work along the line of accounts. A sewing teacher in Ames takes ten minutes per week for the girls to record their purchases of the previous week. Why can't the teachers of manual training, mathematics, or history do the same thing?

"What good does it do?" is a question often asked. Put things down in black and white for a month and see if you can't find the answer. See how small amounts count up. A teacher relates that when stamps went up to three cents, she paid her bills personally in-

stead of mailing checks. She saved only fifteen cents per month but this amounted to a dollar and eight cents per year, which more than paid her subscription to a magazine.

A young college girl says, "When I first started to college I went down town nearly every afternoon with a group of girls. We spent ten cents each for car fare, and besides often went to a movie or bought ice cream. When I kept accounts a month I realized that I couldn't afford the car fare, let alone the money I spent foolishly. I figured that the money I spent per week for two unnecessary trips to town would amount to ten dollars per year, which would buy me either a good pair of shoes or a hat.

In several Iowa schools children have kept accounts this past year as part of their school work. From a study of their expenses the following form has been worked out in the Extension Department of Iowa State

PERSONAL EXPENSE BLANK

DATE	CLOTHING	LUNCH CANDY GUM, ICE CREAM	SCHOOL SUPPLIES	AMUSEMENTS	CHURCH CLUBS GIFTS	SAVINGS	MISCELLANEOUS	MONEY REC'D FROM PARENTS	MONEY EARNED

College which it is hoped will meet the needs of eighth-grade and high school pupils.

After they have kept accounts for a few months, they have a basis for budget study.

High school girls especially are apt to want what other girls have. They are apt, too, to do a great deal of complaining if their wishes are not gratified.

It may make a great difference in their wants and in the peace of the family if they realize that not more than twenty per cent of the income should be spent for clothing. If the income is $1200, the clothing amount should not exceed $240. Let the pupils divide this amount among the members of the family, then figure what clothing can be bought for each one.

In the high school an additional clothing page may be necessary. If it is, it is well to have it divided into the following divisions: outer garments, undergarments, hats and gloves, shoes and stockings and miscellaneous. One budget specialist has worked out the following per cents for the different divisions of clothing:

Outer garments	50%
Under garments	15%
Shoes and stockings	25%
Hats and gloves	7%
Miscellaneous	3%

If a girl tries to figure a budget to these per cents she may find that georgette waists fade into insignificance; that silk underwear has no place in her wardrobe; that the amount usually spent for silk stockings should cover the cost of both shoes and stockings. Will she not be a more thoughtful girl and make less demands on her parents?

These are strenuous times for many families and especially for the ones whose children are in high school, for it costs a great deal to clothe and feed them, and they are not yet contributors to the family income.

If the teachers can do anything to help the parents solve their problems, they are doing a real service. Start in the first of the school year to talk accounts and to keep accounts. They will mean live problems for the arithmetic teacher and furnish good theme material for the teacher of English. They should be the foundation on which the whole home economics course is built.

Federal Aid to Vocational Schools.

Dr. John Cummings, in a recent study of federally aided vocational schools, shows that a total of 2,039 schools of all types received aid from federal funds in the year ended June, 1919, amounting to an increase of 298 over that in 1918. In the report the number of vocational schools federally aided in 1919 and in 1918, and the amount of federal reimbursement to these schools are given by type of school—separate administrative units separately reimbursed being counted as separate schools as follows:

Number of Schools Federally Aided June, 1919 and 1918, and Federal Reimbursement, 1919.

	Number		Reimbursement	
Type of School	1919	1918	Amount	Average
Agriculture	863	609	$526,122.43	$609.64
Trade or Industrial:				
Evening	325	300	82,867.40	254.98
Part-time	83	(1)	85,856.72	1,034.42
All-day	167	168	258,231.75	1,546.29
Home Economics:				
Evening	127	123	23,877.04	188.01
Part-time	27	(1)	7,983.48	295.68
All-day	309	200	86,635.77	280.37
Part-time Continuation	138	(1)	64,944.42	470.61
Total, part-time (2)	248	341	158,784.62	640.26
	2,039	1,741	$1,136,519.01	$557.88

(1) Not separately reported for 1918.
(2) Includes types of part-time schools shown separately for 1919.

PROBLEMS AND PROJECTS

The Department of Problems and Projects aims to present each month a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration. The editors will not accept the old hackneyed problems of footstools, taborets, towel holders, etc., which have been made from time immemorial, ad nauseum.

Drawings and manuscripts should be addressed: The Editors, INDUSTRIAL-ARTS MAGAZINE, Milwaukee, Wis.

FINISHING KIDDY KAR WHEELS.

Joseph A. Shelley, Jersey City, N. J.

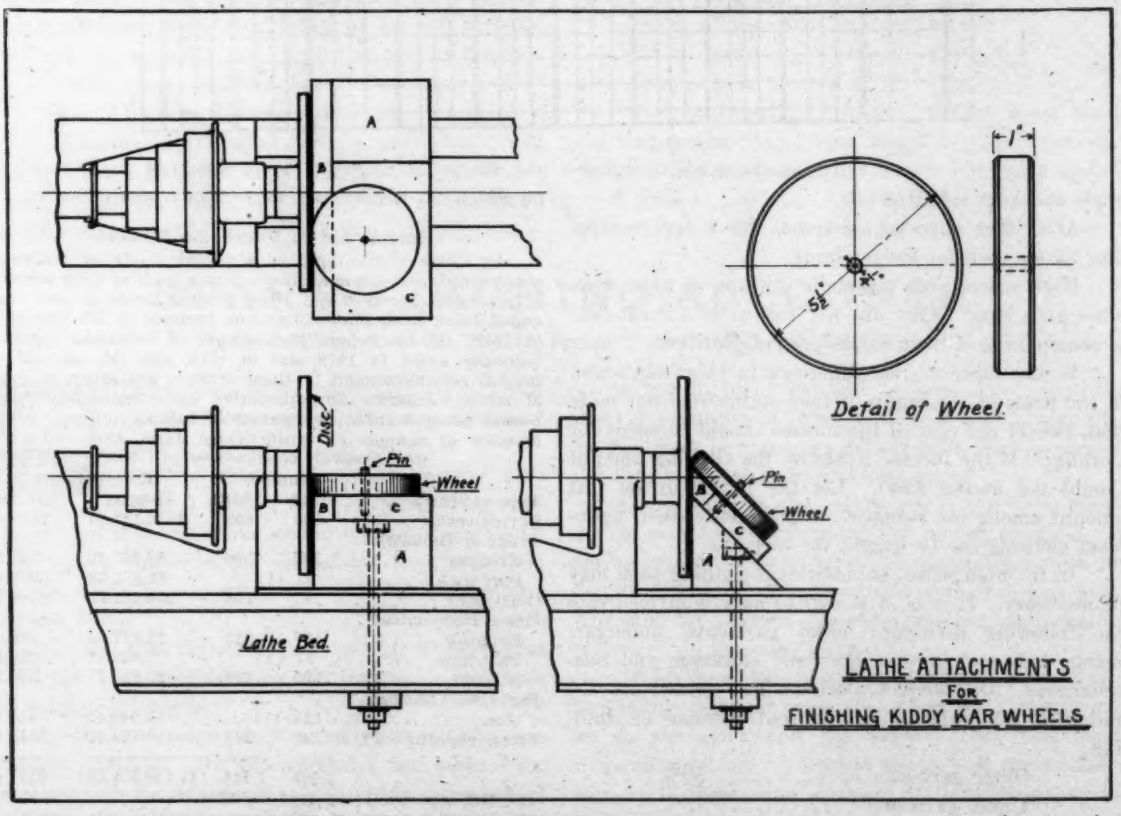
In making blanks for solid wheels for Kiddy Kars two methods may be followed. The blank circles may be laid off on the stock and the central holes bored with a brace and bit or the blanks may be band sawed and the central holes bored in the lathe. A drill chuck fitted to the live spindle and a drilling pad for the tail stock spindle will be required to do this job efficiently. The tail stock is locked fast and the blank to be drilled is placed against the drilling pad and fed up to the revolving bit by turning the tail spindle feed wheel or crank. Boring the holes in the lathe is best as a cleaner hole and one that will be square with the wheel face results. More students may be simultaneously employed, however, if braces and bits are used and this fact is very often the deciding factor in choosing between methods in a school shop. A fairly good wheel may be produced by either of these methods but it will have square corners and will be more or less out of truth owing to the difficulty of boring a hole in the exact center of a wood blank.

To true up and smooth the outside of the blanks and chamfer the corners, the lathe attachments that are the subject of this description were devised. The "rig" for truing and smoothing the outside of the blanks is shown in plan and front view at A. It consists of a block (a) fastened to the lathe bed with a single bolt and a stop (b) fastened to the upper face of the block (a). The carriage (c) is a loose piece the same thickness as the stop (d) and it is provided with a pin to fit the central hole in the blank. This pin is so located that when the edge of carriage (c) is tight against the edge of stop (d), the distance from the center of the pin to the face of the abrasive material fastened to the grinding disc (d) will be equal to the radius of the finished wheel.

In operating, the blank which is made a scant 1/16" oversize in diameter, is placed on the pin in the carriage (c) which is held flat on block (a) while the edge of the blank is brought in contact with the grinding disc face by pushing the carriage forward with the left hand while the blank is slowly revolved with the right. This grinding is continued until the edges of stop (b) and carriage (c) will remain in contact during a complete revolution of the wheel blank. During this grinding process, the carriage should be moved back and forth from the edge to the center of the grinding disc so that the wear on the abrasing surface of the disc may be equalized.

A similar device used for chamfering the edges of the blanks is shown at B, as it looks when viewed from the front of the lathe. The preceding description will suffice for this as the same system of lettering has been used. It differs only in that block (a) is made to set at an angle of 45° instead of being level.

Grinding discs may be made either of metal or



DETAILS OF LATHE ATTACHMENT FOR TURNING WHEELS.

wood; metal is preferable but a hardwood disc fastened to a metal face plate will answer very well. There are many methods of fastening the abrasing material to the disc but the most convenient way is by the use of stick belt dressing. The disc is coated with dressing by holding the stick against it as it revolves and the abrasive is applied before the dressing has set. A pair of dividers or trammels is used to cut the abrasive material to the same diameter as the disc and it should be warmed on the uncoated side before it is applied. It sticks tightly to the disc but is easily removed and replaced with fresh material in a few moments.

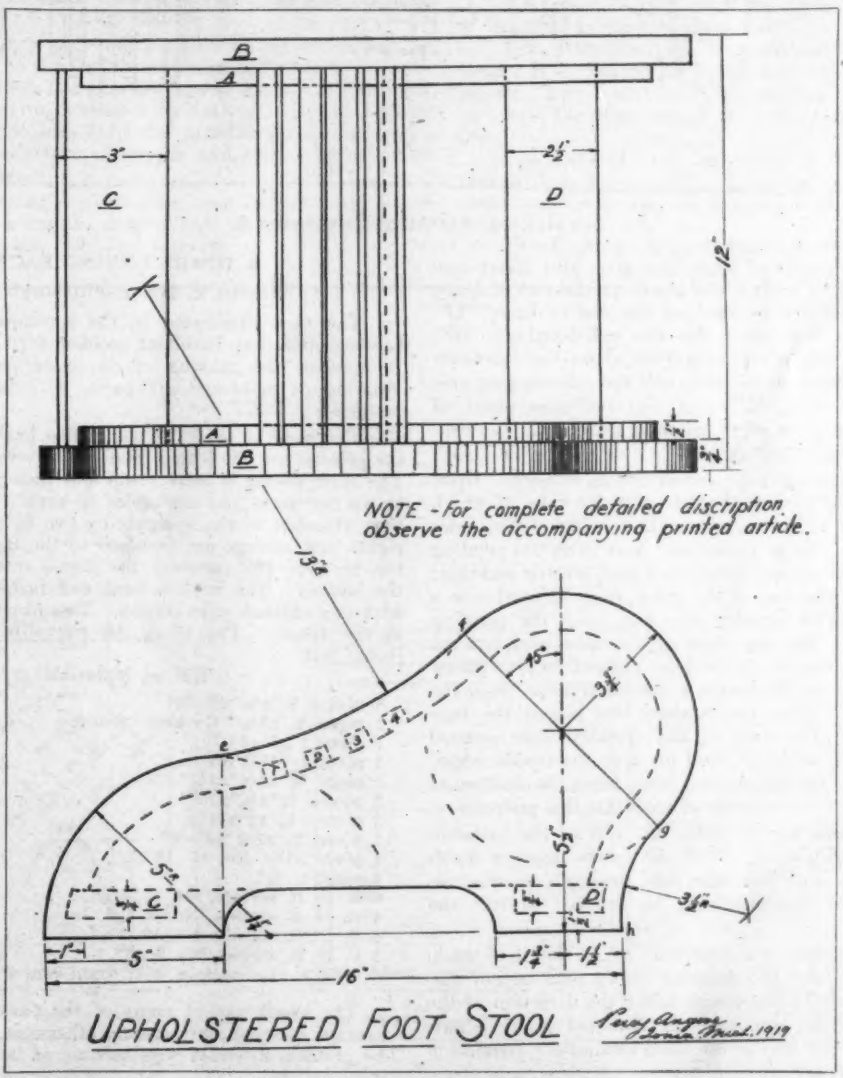
AN UPHOLSTERED FOOTSTOOL.

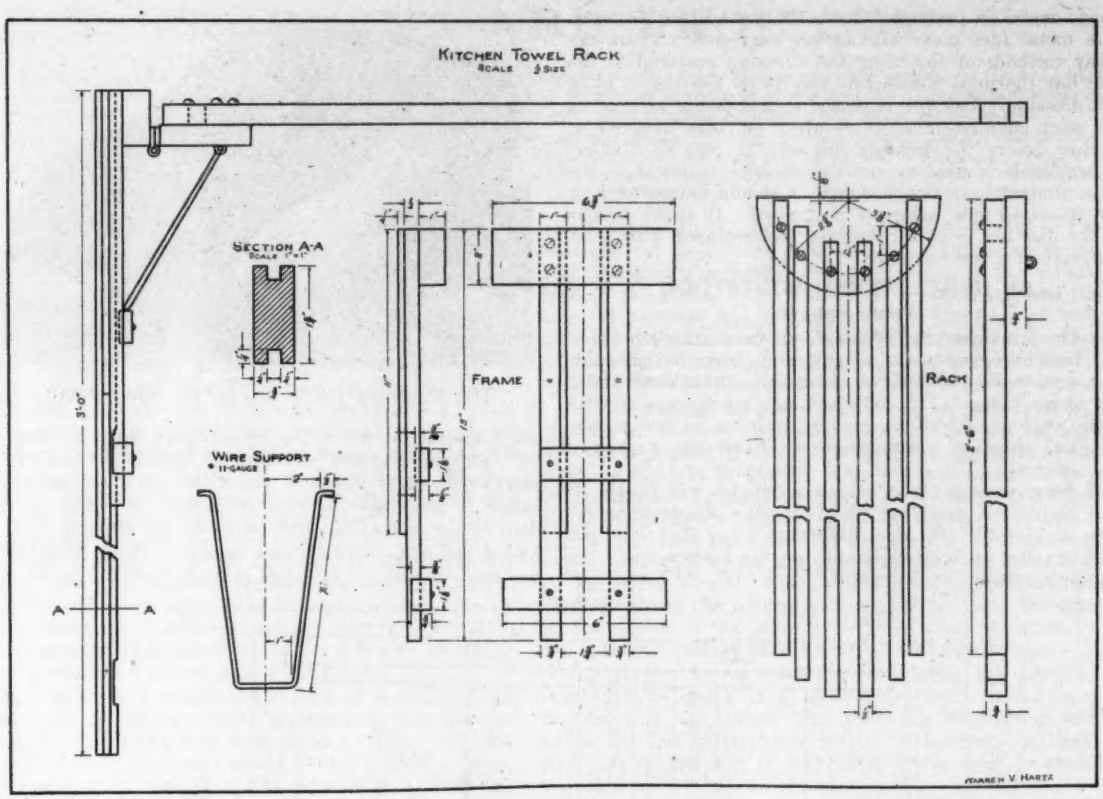
Percy Angove.

The accompanying illustrations show a footstool that has been designed so as to get away from the straight-line, square-top footstools so common in our manual training shops today. This footstool was made by a seventh grade student and offers splendid training in design, mechanical drawing, turning-saw or band-saw work and upholstering. The design was first made and drawn on stiff drawing paper from which a templet was made. It will be noticed that part "A" is exactly the same in design as part "B" the only difference being that it is one inch smaller on both ends and top, its bottom when put together resting on braces "C" and "D", "A" and "B"

BOY'S ROUGH FIRST MODEL OF FOOT STOOL.

are fastened to "B" either by screwing thru the face of "B" and plugging the hole to cover the head of the screws afterwards, or by means of a mortise and tenon joint, the latter is preferable because it insures no break in the face of the side of the footstool. In the drawing 1, 2, 3, and 4 are slats one-half inch square. These fit between the two sides of the footstool and are fastened on the top





DETAILS OF KITCHEN TOWEL RACK.

of part "A" by means of brads and glue, laid about one-half inch apart. The first slat starts on the end of brace "C" and the last one finished on the end of brace "D". This forms the foundation for the upholstering. "E", "F", "G", "H" indicate braces from where the intersecting arcs were struck to find the radii for constructing arcs "E", "F" and "G", "H", and also indicates point of tangency. This alone offers splendid training in the constructing of tangent arcs.

The upholstering was carried out as follows: Upon the slats was laid a piece of duck cloth the sides of which were cut so as to turn up over the inside of the sides of the footstool, this to insure any dust from the padding falling thru the bottom. Upon this was laid the padding; enough so that the top of the stool when finished was a little curved. The tapestry was laid upon the padding and tacked upon the top edges of the sides and finished with a tape to match. It will be noticed by the photograph that it is finished with a roll edge made from the same material. After the tapestry was placed the tape was glued on. The ends of the tapestry were secured under brace "C" and "D" and up over the inside edges, the brace being raised one-half inch from the bottom of the footstool to insure plenty of room for this purpose.

Oak was used for the sides, the rest of the footstool was made of soft wood. The only parts needing finish were the sides, and this was done previous to the upholstering. The footstool may be finished to suit the owner.

The photograph is a reproduction of the stool made by the student, but the drawing shows some minor improvements made in the design under the direction of the author. It will be seen that the footstool makes a natural, easy foot rest and at the same time offers correlation in the subjects indicated in a previous paragraph.

A TOWEL DRYING RACK.

Warren V. Hartz, Pittsburgh, Pa.

The rack illustrated in the accompanying drawing, has been found an excellent problem for the eighth grade. It involves the making of duplicate parts, the understanding of right-and-left parts, wire bending and adjustment.

The rack is made of oak. The back is made first; the grooves are cut with a Stanley universal No. 45 plane. The rack proper is next made and then the parts of the frame are made and assembled in turn. The springs are then attached to the uprights by two ½" screws; the uprights and springs are fastened to the large block at the top by four 1½" screws; the frame rest is attached at the bottom. The wire is bent and fastened to the rack with two chicken wire staples. Two hinges hold the rack to the frame. The block for the wire support is adjusted last.

Bill of Materials.

6 pieces ¾"x1½"x2'—6"
1 piece ¾"x3⅜" R—half—round.
1 piece 1"x2"x6¾".
1 piece ¾"x1⅛"x6".
1 piece ½"x1⅛"x3¼".
2 pieces ¾"x1½"x15".
2 pieces ¼"x1"x11".
1 piece ¾"x1¾"x3'—0".
1 piece wire, No. 11, 18".
2 staples, ¾".
6 R. H. B. screws, No. 10, 1½".
4 R. H. B. screws, No. 6, ¾".
4 F. H. B. screws, No. 10, 1½".
2 F. H. B. screws, No. 2, ½".
2 hinges, 1½" narrow butt, tight pin, with ⅝" screws.

The small size of many of the parts allows the use of scraps of wood which would otherwise be thrown away. The problem interests boys because of its mechanical and useful nature.

A SHOE SHINE BOX.

J. W. Heatley, Pittsburgh, Pa.

A shoe shine box that is easily within the capacity of the eighth grade boy, and one that involves tool processes especially adaptable to this grade, is shown in the accompanying illustration.

The box is unique in design and yet very practical. Because of its design, certain tool processes are possible and types of construction that can be simplified to fit the ability of the average boy of this grade.

The router plane, fostener bit, compass saw, and the use of saw guide stripes are special tools used in this problem.

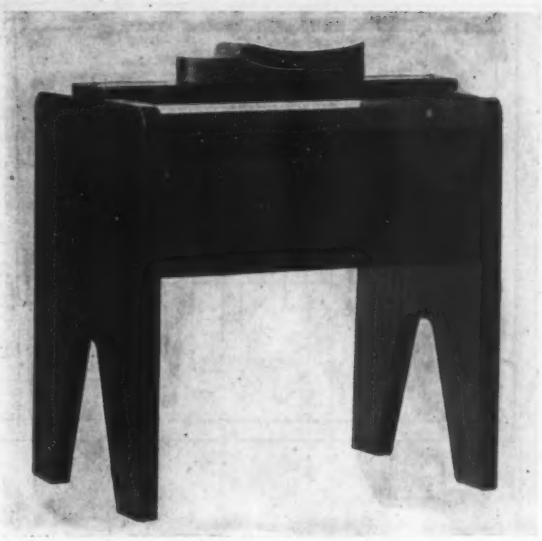
The construction involves the working of two intersecting dadoes at right angles to each other. The writer advises to first bore with a $\frac{3}{4}$" fostener bit at the intersection of the grooves and then remove some surplus material for saw clearance. To complete the groove, fasten saw guide strips along the lines and saw to the required depth with a back saw. The use of guide strips to work out the clearance for the legs also simplifies the problem for the student. Two $\frac{3}{4}$" holes should be bored before placing the strips; the waste material is finally removed with a compass saw.

TELEGRAPH KEY AND SOUNDER.

Thomas L. Lawson, Instructor of Manual Training, Elizabeth, N. J.

The telegraph key and sounder, in the accompanying drawing, can be successfully made by a boy in the seventh or eighth grade. The construction of the key and sounder brings the boy in contact with various materials besides wood and leads him into the manufacturing industries such as, manufacture of copper and steel wire, of bolts, screws and fibre.

The work can be carried on, on a factory basis, where each boy has a certain definite part to make, or each boy can make his own key and sounder.



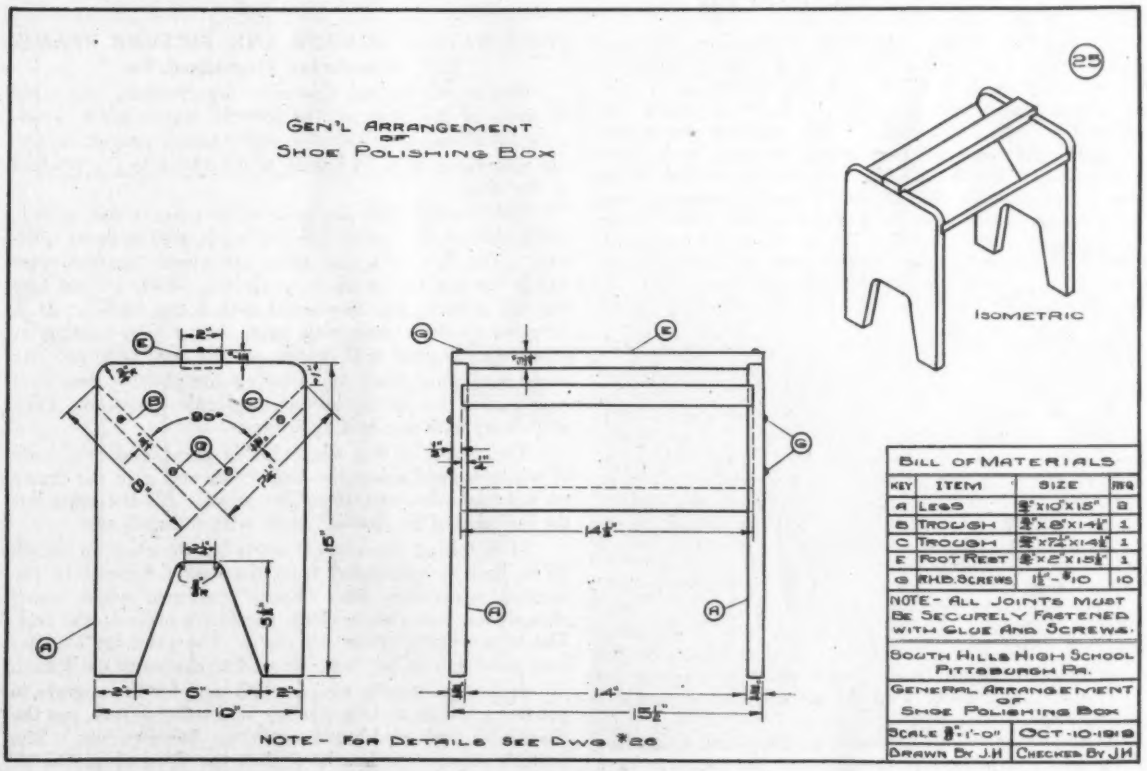
SHOE POLISHING STAND AND BOX.

The Base (A), $\frac{7}{8}$"x5"x8" is made of pine, having a $\frac{1}{4}$" chamfer on the top edges.

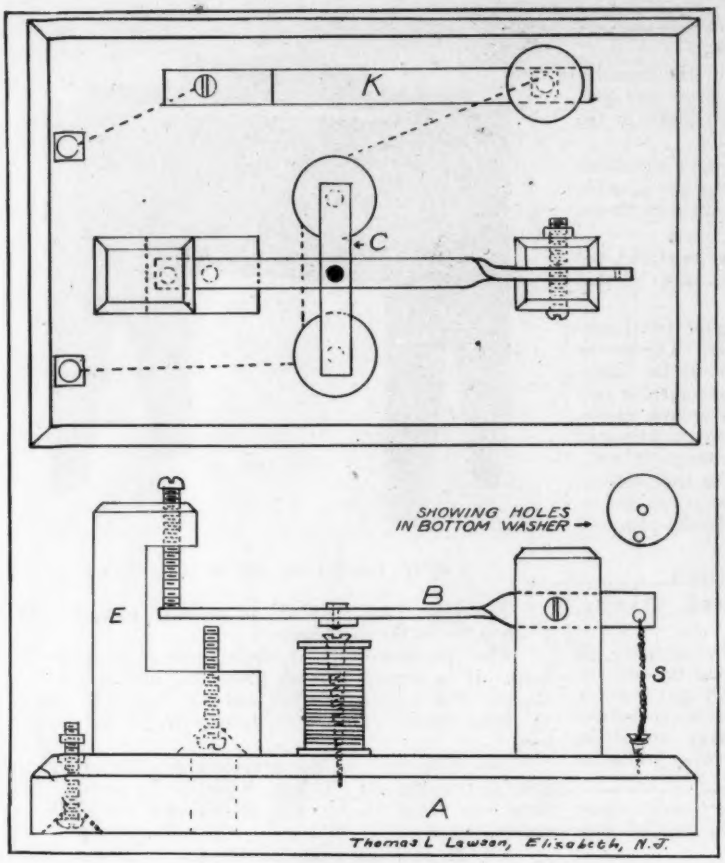
The Armature (B), is made from $\frac{3}{4}$" strap iron, 6" long. It is heated 2" back from one end and bent as shown. Two inches from one end a $\frac{1}{4}$" hole is drilled and $1\frac{1}{4}$" from the other end, a $\frac{5}{16}$" hole is drilled for the stove bolt.

The Yoke (C), of the armature is made of $\frac{3}{4}$" strap iron, 3" long having a $\frac{1}{4}$" hole drilled in the center. After these two pieces are cut and drilled they are riveted together.

The Magnets are made from two 2" F. H. wood screws


25
GEN'L ARRANGEMENT OF SHOE POLISHING BOX
ISOMETRIC
BILL OF MATERIALS
KEY | ITEM | SIZE | REQ
A | LEGS | 7/8" X 10" X 15" | 2
B | TROUGH | 3/4" X 6" X 14 1/2" | 1
C | TROUGH | 3/4" X 7 1/2" X 14 1/2" | 1
E | FOOT REST | 7/8" X 2" X 15 1/2" | 1
G | RHD. SCREWS | 1 1/2" - #10 | 10
NOTE - ALL JOINTS MUST BE SECURELY FASTENED WITH GLUE AND SCREWS.
SOUTH HILLS HIGH SCHOOL PITTSBURGH PA.
GENERAL ARRANGEMENT OF SHOE POLISHING BOX
SCALE 3" = 1'-0" | OCT-10-1919
DRAWN BY J.H | CHECKED BY JH
NOTE - FOR DETAILS SEE DWG #26

DETAILS OF BOX.



TELEGRAPH KEY.

No. 10, the fibre washers being $\frac{7}{8}$" in diameter, cut from $\frac{1}{16}$" fibre, with a $\frac{7}{8}$" washer cutter. A $\frac{1}{8}$" hole is drilled in the center of each washer, with the exception of the two bottom washers which have two holes as shown, the smaller being $\frac{1}{8}$" in diameter. The washers are spaced $1\frac{1}{4}$" apart, the space between being wrapped with three layers of paper shellaced. The magnets are wound in the same direction with No. 22 double cotton covered wire. The winding can be done on a Yankee Drill Press if the shop does not contain a lathe. In winding, the beginning of the wire is put thru the smaller hole and wound carefully. If the layers become uneven a layer of paper between every other two layers of wire, will help to keep site even.

The Bearing (D), is made from a piece of pine $\frac{7}{8}$"x1", $2\frac{1}{2}$" long, having a $\frac{1}{4}$" chamfer on top and is fastened to the base by means of a $1\frac{1}{4}$" F. H. wood screw.

The Standard (E), is of $\frac{7}{8}$" pine 2" long and 3" high, being cut as shown, having a $\frac{1}{8}$" chamfer. The stove bolts are $\frac{3}{16}$" in diameter, the hole thru which they pass being $\frac{1}{8}$" in diameter, which allows the bolts to be driven in snugly.

The Spring (S), is made from piano wire and should be strong enough to pull the armature back in place when the current is shut off.

The Key (K), is of stove pipe iron, $\frac{3}{8}$" wide and 5" long, using a piece of $\frac{1}{4}$" dowel rod for a knob.

Connections—Connect the opposite ends of the magnets. The other two ends are connected as shown by the dotted lines on the drawing. The contact point under the key is a $\frac{3}{16}$" stove bolt. Two $\frac{3}{16}$" stove bolts are used for binding posts.

If the sounder does not work on first trial, either the spring on the armature is too tight, or the magnets have not been wound carefully.

COMBINATION PICTURE FRAME AND MIRROR MADE IN THE CLASSES OF MR. A. F. WINTERSTEEN, HOMESTEAD, PA.

COMBINATION MIRROR AND PICTURE FRAME.

C. F. Wintersteen, Homestead, Pa.

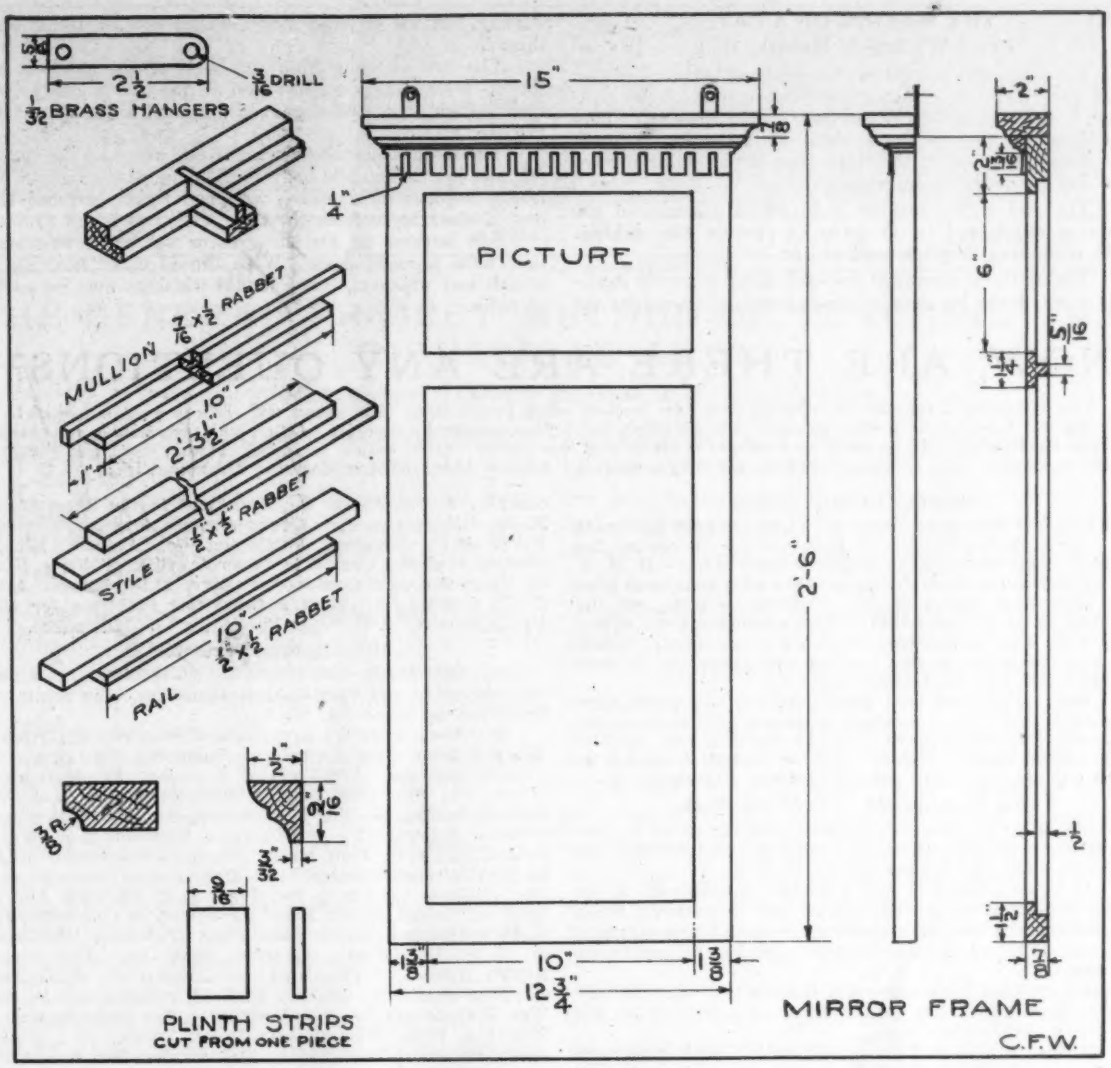
The mirror frame, shown in the drawing, was made by some of the more skilled boys in eighth grade woodworking classes. As an elementary bench project involving only hand tools, it helped to give tone to the product of the shop.

Soft wood, either poplar or white pine, is best as it is easily shaped, and takes the few brads used without splitting. The two rails and stiles are glued together after which the mullion is set in as shown. With a little care the cap molding can be shaped with gouge chisels. It is fastened to the frame with brads and a thin coating of glue. Any lumber mill can supply the cove molding. By using a planing block and planing the plinth pieces in a single piece the cutting becomes a simple operation. They are nailed with one-half inch brads.

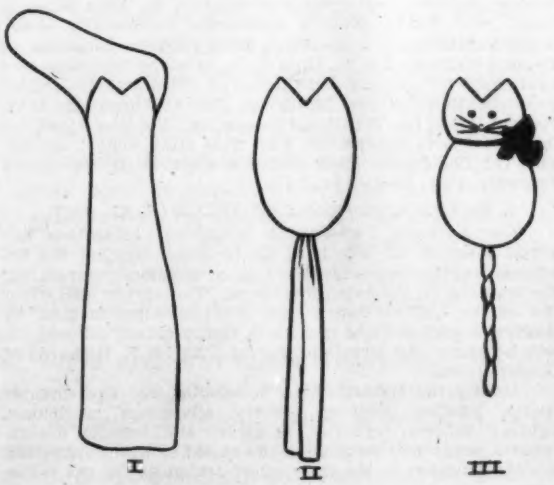
Two coats of flat white inside paint and two coats of white enamel make the best finish and give the frame an unbroken flat surface at the joints. All the coats but the last should be sanded lightly with 00 sandpaper.

If in taking the measurements for the glass an eighth of an inch is subtracted from the inside dimensions the mirrors invariably fit. "Shock" mirrors while much cheaper are not always clear, therefore, plate is the best. The boys usually prefer the plate. The glass for the picture panel can be cut from pieces found around the school.

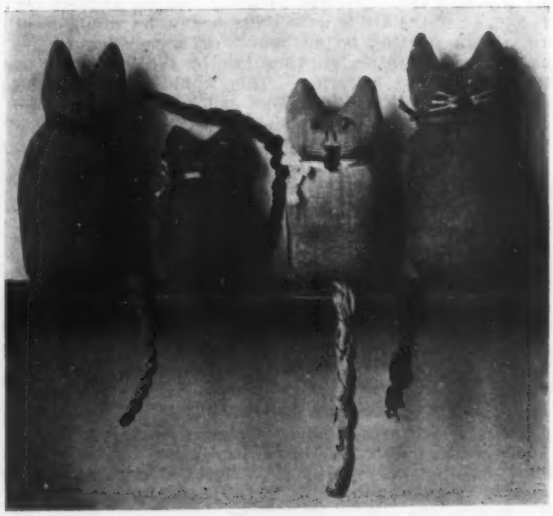
It is some trouble to order and send for the mirrors, to get the molding, to help the boy select the picture, get the "backing" and card-board covering, hangers, etc. The writer's experience has been that the finished pieces always justified the effort.



DETAILS OF PICTURE AND MIRROR FRAME.



DETAILS IN THE MAKING OF A CAT.



A ROW OF CATS.

THE MAKING OF A CAT.

Grace W. Engels, Newark, N. J.

A simple, very inexpensive problem in sewing and one that never fails to create great interest among the children, is the making of the cat from an old stocking. This has been very successfully worked out in the second grade but it may be used in the third year if the children have had little experience in sewing.

The aim of the teacher is to afford practice on the running stitch and in so doing to provide the children with something they can well utilize.

The material necessary for each child is an old stocking in which the leg part is intact, cotton or snippings for stuffing, buttons or paper fasteners for eyes, a needle and thread.

The ears are cut from the heels of the stocking as shown in the diagram and sewed on the inside about one-eighth inch from the edge with a small running stitch. Fig. 1.

The stocking is then turned inside out, and the stuffing put in. When the body is filled in proportion to its width, a piece of thread is wrapped tightly around the rest of stocking to form the tail. (Figures 2 and 3).

Sew buttons on for the eyes or use paper fasteners that have pronged ends. With thread make nostrils, a mouth and whiskers, but splendid whiskers may be made of raffia.

NOW, ARE THERE ARE ANY QUESTIONS?

This department is intended for subscribers who have problems which trouble them. The editors will reply to questions, which they feel they can answer, and to other questions they will obtain replies from competent authorities. Letters must invariably be signed with full name of inquirer. All questions are numbered in the order of their receipt. If an answer is desired by mail, a stamped envelope should be enclosed. The privilege of printing any reply is reserved. Address, Industrial-Arts Magazine, Milwaukee, Wis.

Cleaning Shellac Brushes.

10. Q:—Will you please inform me as to the best ways to keep a shellac brush? If they are left in shellac the alcohol evaporates and the shellac is hard to use.—*H. M. A.*

A:—Wash out the shellac brushes with denatured alcohol after each period of use. Carefully smooth out the bristles so as to make the brushes assume a neat, chisel-like form and lay out carefully on a clean board. It will be found that the shellac brushes will always be in good condition if kept in a clean place.

The alcohol used as a wash need not be wasted since it may be put into a separate container and when a pint or more has accumulated, may be strained and used to dilute stock shellac. Brushes cannot be left in alcohol as they quickly lose their natural stiffness and elasticity.

Coal Consumption in Smithing Work.

19. Q:—Can you give me any information as to how much coal a student operating a forge in ordinary smithing operations should burn per hour?—*H. G. M.*

A:—The amount of coal a student should burn in an hour is a question not so easy for one to answer. Much depends on the kind of work being done and how carefully the instructor watches the student, also how industriously he works.

All students burn more coal than is necessary for the reason that they do not understand the handling of the fire as does an experienced man.

It seems to me that the correspondent has burned very little coal. If one is bending small hooks and staples, or something along that line, he can get along for an hour with a double handful of coal, but if he should be practicing on welding or forging, he would require at least six pounds, and if the stock were quite heavy, he would need more. I am figuring on an hour. Of course during the week there is more or less time lost by the instructor in demonstrating and lecturing. This would cut down the amount quite a little—just how much I cannot say.—*Thomas F. Googerty.*

Books on Pottery Work.

20. Q:—Will you give me the names of one or more books on pottery suitable for schools?—*L. A. D.*

A:—*Webb's Pottery Making*, $1, Lewis Institute Chicago; *Binn's Potter's Craft*, $2, D. Van Nostrand, New York; *Cox's Pottery for Artists, Craftsmen and Teachers*, $1.32, School Arts Publishing Co., Boston; *Jervis' Pottery Primer*, $1, Munn & Co., New York; *Talbot's How to Make Pottery*, $1, Doubleday, Page & Co., Garden City, N. Y.; *Beckwith's Pottery*, $0.60, D. Van Nostrand, New York; *Manual of Practical Pottery*, $7.50, D. Van Nostrand; *Searles' Clay Worker's Handbook*, $2, Lippincott Co., Philadelphia.

Problems in Cement.

22. Q:—Will you kindly recommend some pamphlets or books which treat of the use of cement as a material for manual training projects in the school? I am interested in descriptive matter in which the problems are simple and easily constructed.—*W. R. F.*

Campbell and Beyer's Practical Concrete Work for the School and Home, $1.50, Manual Arts Press, Peoria, Ill.; *Campbell's Concrete on the Farm and in the Shop*, $0.75, N. W. Henley Co., New York; *Henry's Practical Cement Work*, $0.50, Concrete Publishing Co., Detroit, Mich.; *Manual Training Course in Concrete*, $0.25, *Fallen's How to Make Concrete Garden Furniture*, $1.50, Manual Arts Press, Peoria, Ill.; *Worst's Industrial Problems for the Middle Grades*, $3.50, Bruce Publishing Co., Milwaukee.

Miscellaneous Textbooks.

23. Q:—Would like textbooks on architectural drawing, carpentry and vocational mathematics, blue prints of buildings and plans.—*A. W. T.*

Greenberg & Howe's Architectural Drawing, $1.50, John Wiley & Sons, New York City; *Hodgson's Easy Steps to Architecture and Architectural Drawing*, $1, McDewitt-Wilson Co., New York City; *Varon's Indication in Architectural Design*, $5, Wm. T. Comstock Co., New York City; *Windoes & Campbell's Architectural Drawing*, $1.50, Webb Publishing Co., St. Paul, Minn.; *Seaman's Progressive Steps in Architectural Drawing*, $1.25, Manual Arts Press, Peoria, Ill.; *Kilbon's Carpentry for Boys*, $0.75, Lothrop, Lee & Shepard, Boston, Mass.; *Roehl's Problems in Carpentry*, $1, Webb Publishing Co., St. Paul, Minn.; *Teacher's Handbook of Carpentry*, (King), American Book Co., New York; *Riley's Manual of Carpentry and Joinery*, $1, Macmillan Co., New York City; *Kidder's Building Construction Series*, Wm. T. Comstock Co., New York City; *Van Deusen's House Planning*, $0.25, Manual Arts Press, Peoria, Ill.; *Townsend's Carpentry and Joinery*, $1, American School of Correspondence, Chicago; *Hall's Carpentry and Mechanics*, $2, Lothrop, Lee & Shepard, Boston, Mass.; *Dale's Arithmetic for Carpenters and Builders*, $1.25, John Wiley & Sons, New York; *Dooley's Vocational Mathematics*, $1, D. C. Heath, Boston; *Marsh's Industrial Mathematics*, $2, John Wiley & Sons, New York; *White's Industrial Arithmetic*, $0.80; Webb Publishing Co., St. Paul, Minn.; *Cobb's Elements of Applied Mathematics*, $1, Ginn & Co., Boston; *Buildings and Equipment for Schools and Classes in Trade and Industrial Subjects*, Bulletin No. 20, Series No. 4, November, 1918, Federal Board for Vocational Education; *Bidding Blank for Industrial Arts Equipment*, East Side High School, Cincinnati, O.; *The Junior High School at Futuria* (*School Board Journal*), Feb., Mar., Apr., 1918.

A NATIONAL SURVEY OF INDUSTRIAL ART.

The National Society for Vocational Education has begun a survey of industrial art to bring together the art schools and the manufacturers in a common program for the training of American designers. The survey will cover the entire United States and will be supplemented by studies of methods and results in European art schools. It will be under the direction of Prof. Charles R. Richards of Cooper Union.

Among the industries to be studied are the costume trades, textiles, printing, jewelry, silverware, wallpaper, lighting fixtures, ceramics, furniture and interior decoration. A study will be made of the extent to which American schools function in the training of designers for the industries.

An important feature of the survey will be an advisory committee of persons prominent in art industries.